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THE CHEMISTRY OF COOKERY.

XXXVI.

By W. MATTIEU WILLIAMS.

A CORRESPONDENT from Hereford refers to the concluding paragraph of my last paper "as too valuable to let slip, without making practical use of it," and, accordingly, asks for further information concerning the salts that should be contained in our food, and "in what other form can a poor mortal obtain them."

As the question may have presented itself to many other readers, I will answer it here, especially as I can speak from practical experience of the miseries that may be escaped by understanding and applying it. I inherit what is called a "lithic acid diathesis." My father and his brother were martyrs to rheumatic gout, and died early in consequence. I had a premonitory attack of gout at the age of twenty-five, and other warning symptoms at other times, but have kept the enemy at bay during nearly forty years by simply understanding that this lithic acid (stony acid) combines with potash, forming thus a soluble salt, which is safely excreted. Otherwise it is deposited here or there, producing gout, rheumatism, stone, gravel, and other dreadfully painful diseases, which are practically incurable when the deposit is fairly established. By effecting the above-named combination in the blood the deposition is prevented.

The potash required for the purpose exists in several conditions. First in its uncombined state as caustic potash. This is poison, for the simple reason that it combines so vigorously with organic matter that it would decompose the digestive organs themselves if presented to them. The lower carbonate is less caustic, the bicarbonate nearly, but not quite, neutral. Even this, however, should not be taken *as food*, because it is capable of combining with the acid constituents of the gastric juice.

The proper compounds to be used are those which correspond to the salts existing in the juices of vegetables and flesh—viz., compounds of potash with *organic* acids, such as tartaric acid, which forms the potash salt of the grape, such as citric acid, with which potash is combined in lemons and oranges; malic acid, with which it is combined in apples and many other fruits; the natural acids of vegetables generally; lactic acid in milk, &c.

All these acids, and many others of similar origin, are composed of carbon, oxygen, and hydrogen, held together with such feeble affinity that they are easily dissociated or decomposed by heat. This may be shown by heating some cream of tartar or tartaric acid on a strip of metal or glass. It will become carbonised to a cinder, like other organic matter. If the heat is raised sufficiently this cinder will all burn away to carbonic acid and water in the case of the pure acid, or will leave carbonate of potash in the case of cream of tartar or other potash salt.

Unless I am mistaken, this represents violently what occurs gradually and mildly in the human body, which is in a continuous state of slow combustion so long as it is alive. The organic acids of the potash salts suffer slow combustion, give off their excess of carbonic acid and water to be breathed out, evaporated, and ejected, leaving behind their potash, which combines with the otherwise stony lithic acid tormentor just when and where he comes into separate existence by the organic actions which effect the above-described slow combustion.

If we take potash in combination with a mineral acid, such as the sulphuric, nitric, or hydrochloric, no such decomposition is possible, the bonds uniting the elements of the mineral acid are too strong to be sundered by the mild chemistry of the living body, and the mineral acid, if separated from its potash base, would be most mischievous, as it precipitates the lithic acid in its worst form.

For this reason, all free mineral acids are poisons to those who have a lithic acid diathesis; they may even create it where it did not previously exist. Hence the iniquity of cheapening the manufacture of lemonade, ginger-beer, &c., by using dilute sulphuric or hydrochloric acid as a substitute for citric or tartaric acid. I shall presently come to the cookery of wines, and have something to say about the mineral acids used in producing the choicer qualities of some very "dry," high-priced samples that, according to my view of the subject, have caused the operations of lithotomy and lithotroty to be included among the luxuries of the rich.

It should be understood that when I recommended the use of bicarbonate of potass for the solution of casein, all these principles were kept in view, including the objection to the bicarbonate itself. In the case of the cheese the quantity recommended was based on an estimate of the quantity of lactic acid existing in the cheese and capable of leaving the casein to go over to the potash. In the case of the peas the quantity is difficult to estimate, owing to its variability. The more correct determination of such quantities is among the objects of further research, and which I alluded to in my last.

Speaking generally it is not to the laboratory of the chemist that we should go for our potash salts, but to the laboratory of nature, and more especially to that of the vegetable kingdom. They exist in the green parts of all vegetables. This is illustrated by the manufacture of commercial potash from the ashes of the twigs and leaves of timber trees. The more succulent the vegetable the greater the quantity of potash it contains, though there are some minor exceptions to this. As I have already stated, we extract and waste a considerable proportion of these salts when we boil vegetables and throw away the *potage*, which our wiser and more thrifty neighbours add to their every-day *ménu*. When we eat raw vegetables, as in salads, we obtain all their potash.

Fruits generally contain important quantities of potash salts, and it is upon these especially that the possible victims of lithic acid should rely. Lemons and grapes

contain them most abundantly. Those who cannot afford to buy these as articles of daily food may use cream of tartar, which, when genuine, is the natural salt of the grape, thrown down in the manner I shall describe when on the subject of the cookery of wines.

At the risk of being accused of presumption, I must here protest, as a chemist, against one of "the fallacies of the faculty," or of certain members of the faculty, viz, that of indiscriminately prohibiting to gouty and rheumatic patients the use of acids or anything having an acid taste.

This has probably arisen from experience of the fact that *mineral* acids do serious mischief, and that alkaline carbonate of potash affords relief. The difference between the organic acids, which are decomposed in the manner I have described, and the fixed composition of the mineral acids does not appear to have been sufficiently studied by those who prohibit fruit and vegetables on account of their acidity. It must never be forgotten that nearly all the organic compounds of potash, as they exist in vegetables and fruit, are acid. It may be desirable, in some cases, to add a little bicarbonate of potash to neutralise this excess of acid and increase the potash supply. I have found it advantageous to throw a half-saltspoonful of this into a tumbler of water containing the juice of a lemon, and have even added it to stewed or baked rhubarb and gooseberries. In these it froths like whipped cream, and diminishes the demand for sugar, an excess of which appears to be mischievous to those who require much potash.

I must conclude this sermon on the potash text by adding that it is quite possible to take an excess of this solvent. Such excess is depressing; its action is what is called "lowering." I will not venture upon an explanation of the *rationale* of this lowering, or discuss the question of whether or not the blood is made watery, as sometimes stated.

Intimately connected with this part of my subject is another vegetable principle that I have not yet named. This is vegetable jelly, or *pectin*, the jelly of fruits, of turnips, carrots, parsnips, &c. Fremy has named it *pectose*. It is so little changed by cookery that I need say little about it beyond stating the fact that an acid may be separated from it which has been named pectic acid, the properties and artificial compounds of which appear to me to suggest the theory that the natural jelly of fruits largely consists of pectites of potash or soda or lime. We all know the appearance and flavour of currant jelly, apple jelly, &c., which are composed of natural vegetable jelly plus sugar.

The separation of these jellies is an operation of cookery, and one that deserves more attention than it receives. I shall never forget the *rahat lakoum* which I once had the privilege of eating in the kitchen of the Seraglio of Stamboul, in the absence at the summer palace of the Sultana and the other ladies for whom it was prepared. Its basis was the pure pectose of many fruits, the inspissated juices of grapes, peaches, pine-apples, and I know not what others. The sherbet was similar, but liquid. Well may they obey the Prophet and abstain from the grosser concoctions that we call wine when such ambrosial nectar as this is supplied in its place! It is to Imperial Tokay as tokay is to table-beer!

The "lumps of delight" sold by our confectioners are imitations made of flavoured gelatine. Similar substitutes are sold in Constantinople. The same as regards the sherbet.

I conclude this part of my subject by re-echoing Mr. Gladstone's advocacy of the extension of fruit-culture. We shamefully neglect the best of all food, in eating and drinking so little fruit. As regards cooked fruit, I say jam for the million, jelly for the luxurious, and juice for all. With these in abundance, the abolition of alcohol will follow as a necessary result of natural nausea.

A TAME MARMOSET.*

I MAY here devote a page to our tame monkey, Bildad, or Billy, as we generally call him. This was a very small grey marmoset from Pernambuco, which I had bought of a sailor in Rio de Janeiro. Being much petted, and allowed to run about as he pleased, he became very tame; rather an unusual thing with this genus, for the marmosets are generally rather wild and timid. Even at his best, Billy was somewhat fractious, always biting if we attempted to seize him, though he came to us readily enough if we offered a hand. He was especially attached to my wife, spending hours on her shoulder or on her head, his four arms spread out and his hands clinging fast to her hair; if she put her hat on over him so much the better; if neither head nor shoulder could be had, he would crawl up a sleeve, or under a vest, always turning to poke his inquisitive face out to see if we were observing him. When in a playful mood, he delighted, as a child might, in a game of "peek-a-boo," dodging from side to side behind a cushion and keeping up the game as long as anybody would dodge after him. About once a day Billy was seized with a wild spirit of fun, and a tremendous romp took place. He would leap from one to the other, rushing over us from feet to head, snapping at our noses, pulling our eye-winkers, playing bo-peep from our sleeves, and throwing himself on his back to bite his own toes in an ecstasy of enjoyment. Suddenly, in the midst of a rush, he would stop short, draw back the corners of his eyes, and make an indescribable face at one of his observers; seen for the thousandth time this always provoked us to shouts of laughter, whereat Billy would scuttle away and turn a somersault on the bed. Sometimes for a joke we would put him inside of a large trumpet-flower or in a lamp-chimney or tumbler, and he seemed rather to enjoy his imprisonment. When left to his own resources he ran about the house, sunned himself in a neighbouring tree, or caught flies by approaching them very slowly and grabbing them with one hand. If long neglected he became aggrieved; and then he would find some conspicuous perch and give vent to his troubles in a series of shrill screams. If still unnoticed he would scream yet louder, his face expressing, as only a marmoset's can, the depth of his feelings, the hair on his forehead standing on end, and his whole body trembling with rage. But the exceeding force of his vocal powers was only displayed when we punished him, or when — rare and dreadful occurrence — he was washed; then indeed his lamentations became shrieks, and every line of his face evinced his abhorrence and wrath. On such occasions Billy could only be appeased with a comb; for to be combed was his idea of perfect happiness. As soon as he felt the delightful touch, all sounds would cease; with eyes fixed on vacancy and face expressive of speechless bliss, he would stretch out all four arms and lie quite still at long as we pleased to comb him. He would then submit to lie on his back while his breast was combed, or he would cling with his two front hands to a friendly finger, and with two hinder hands to a chair, while his body was stretched to its utmost length; he would even hang by his hinder hands with his head down, or let us hold him up by the tail.

Billy, having never known a wild life, cared nothing for

* From the *Kansas City Review*.

liberty; if lost in the forest, as happened once or twice, he soon brought us to him by his screams. He slept in a little basket, but generally broke out before morning and climbed to my wife's bed, nesting on her shoulder. Sometimes we carried him in the basket whilst on our journeys, and he was always well contented so long as he felt that he was moving; but if we laid the basket down he presently broke into his usual heart-rending jeremiad. Our first attempt to carry him on horseback resulted well until Billy noticed the horse; then a scream of terror was followed by a wild rush for some hiding-place, and he eventually took refuge in the top of one of my great riding-boots. He was intensely afraid of cats and dogs, but cared nothing about birds, turtles, or snakes. We had a tame land-tortoise which sometimes shared Billy's basket, and the tortoise was frequently robbed of his dinner by its room-mate, who would sit on its back and cooly devour the spoil. The monkey ate almost any vegetable, and even a little meat; he was especially fond of almonds and of cheese, both of which generally resulted in indigestion. He also had an undue fondness for tragacanth paste, which we sometimes used in our work, and if we covered the paste cup he would spend hours trying to pry the cover off. Being spoiled, he was rather saucy, considering that he had the first right to every dish on our table, and helping himself without ceremony, especially to the sugar and milk; brandy he would take if it was well sweetened. Once or twice, while we were living at a hotel, Billy broke loose at dinner time and astonished the boarders by racing over the table to my wife's chair, ending by sitting on her shoulder and making one of his inimitable faces at the assembled people. One day when he occupied his usual place near us a nicely ornamented boar's head was brought in with grinning jaws and staring eyes made of lemons and olives; the monkey, who had never seen the like, put out both hands as if towards the apparition, and retreated with a yell to the farthest corner of the room, whence he was taken trembling.

When we first brought him home Billy's curiosity was much excited by the looking-glass in which he saw, as he supposed, another monkey; having tried in vain to reach his playmate from the front, he looked round the glass and was evidently disappointed at finding nothing there; this performance was repeated at intervals for some days, but after awhile he became accustomed to the phenomenon, and did not notice it further. He was fond of bright colours, gilt buttons, glass beads, and the like; often he tried to pick the flowers from my wife's muslin dress; grasshoppers and beetles were a treat to him, though he seemed to care more about tearing them to bits than eating them; he learned, after repeated punishments, that he must not touch our collections, though he sometimes stole a specimen on the sly.

As the cold weather came on Billy grew sickly, keeping much to the shelter of his basket. One morning he woke in strong convulsions, which were followed by others in quick succession. Coming out of the last he lay quiet for a moment, and we had hopes of saving him; but, as my wife extended her hand to him, he stood up with an effort, made one of his drollest faces at her, and fell over dead.

I suppose that there was not a dry eye in the house when we buried him—my wife had resented as sacrilege the idea of saving his skin for a specimen—and we all agreed that no more playful and affectionate pet had ever been seen. Weeks afterwards I found my wife furtively placing flowers on his grave.*

* I have tried to describe the marmoset's habits accurately and literally, and no part of the account is exaggerated.

THE ENTOMOLOGY OF A POND.

By E. A. Butler.

II.—THE MIDDLE DEPTHS.

LEAVING now the surface and descending to the depths, we encounter a fauna wholly new, though still belonging principally to the same two orders, Coleoptera and Hemiptera, accompanied, however, by reinforcements from a third, the Diptera, but, so far as species are concerned, the beetles vastly preponderate. Commencing with the Hemiptera, the first insect that claims our attention is the well-known "Water-boatman," *Notonecta glauca*. Boatman though he is, his boat is almost always submerged; he often spends a good deal of his time just beneath the surface, where, resting on his oars, with the stern of his boat peeping just above the water, and its prow pointing downwards, he forms one of the most conspicuous and familiar objects in a pond. A rapid swimmer and a bloodthirsty and rapacious monster, he is a terror to the more easy-going inhabitants of the pond, whom he seizes with his fore-legs and holds in a fatal hug, while he eagerly sucks out their juices. Let us take a glance at the form and general appearance of the insect. Flattened beneath, and strongly convex and slightly keeled above, we see at once some resemblance to an inverted boat. The creature, however, has the remarkable habit of always swimming on its back; in fact, in the water, it would hardly know itself right side up. This, of course, brings the "boat" into the proper position. The yellowish head carries two great masses of highly-polished eyes, and has an extremely bold appearance. After the thorax follow the various parts distinctive of bugs, as described in a former paper on "Neglected Insects." There is the large triangular shield-shaped piece, or scutellum, conspicuously placed in the centre, and the composite wings sloping down from its sides, yellowish, but more or less variegated with black. Opening the upper pair we find the others folded up, exquisitely thin and transparent, and with the principal nervures forming a kind of X-mark. The two front pairs of legs are slightly curved, and form efficient organs for the seizure and retention of struggling prey; and any poor creature that once falls into those clutches may think itself fortunate if it can manage to get free before the terrible beak is buried in its tissues, for this once effected there is no hope for the poor victim, which feels itself getting weaker and weaker as it is gradually being drained dry, till the last drop of its life-blood has been drawn out, when its insatiable captor, rejecting the now useless carcass, sets off again in quest of further adventures. The hind legs are very long, and form excellent rowing organs; when the insect is resting at the surface these are spread out at right angles to its sides, and there you have your boat and oars. The terminal joints of these limbs are furnished with long fringes of hair, which greatly increase their efficiency as a rowing apparatus. The larvæ are similar in shape to the adults, but have the body proportionately shorter; when out of the water they look most unfinished creatures, being pale in colour and having a sort of parboiled aspect. They have, of course, no wings, and must therefore spend their time wholly in the water.

Swimming with a similar jerky movement, but not nearly so rapidly, and right side up instead of on their backs, is a whole family of bugs called the *Corixidæ*; they are yellowish, barred and variegated with black and not keeled, but flattened on the back; they are often extremely plentiful, going in large troops together, but as they keep well towards the bottom and do not often come near the surface, they easily escape notice. When one first takes to

pond entomology, little more than a few hauls with the net are needed to create a feeling of astonishment that there can be so much life so near at hand and apparently so easily within view, and yet so entirely unnoticed by the casual observer; it seems almost as if the very passage of the net through the water had been the means of calling into existence the multitudinous creatures that sprawl about on its dripping sides. So scarcely anyone ever notices the Corixidæ without dragging the water, but *then* so numerous do they show themselves to be that the wonder is they could possibly have escaped observation. The genus *Corixa* is a very extensive one, though it has figured in books as larger than Nature ever intended, because the species, while possessing a strong family likeness and general similarity, are extremely variable in the details of their markings, so as to make it difficult to fix on constant characters for their discrimination, and thus many mere varieties have been erroneously constituted species; at present, however, English entomologists reckon twenty-eight species as representing our British contribution towards the genus. Some of these are found only in Scotland, often high up amongst the mountains, and some occur even in brackish water. The genus forms a series gradually diminishing in size from ½ to 1-16 in., and the uninitiated would, no doubt, wish to consider the smaller species as young examples of the larger ones; but it must be remembered that insects do not grow when once they have assumed the adult form; their period of growth consists exclusively of their earlier stages, larvahood and pupahood. Having once donned their wings, they have no further anxiety as to the fit of their chitinous clothing. Their dimensions are finally established. The limits of variability as to size are usually not very wide in any given species, the greatest divergence being found in such insects as are dependent in their earlier stages upon food that is intermittent or precarious in supply. The Corixæ possess fully-formed wings, and the hinder pairs are exquisitely delicate, and show rainbow tints. They readily take to flight, and at night are sometimes attracted to a light, so that if a window be left open on summer evenings near a pond they may be expected to be amongst the visitors that make headlong for the lamp. Dr. Puton, the French Hemipterist, says that in Mexico Corixæ are so abundant that a kind of bread is made of their eggs, and he further makes the astounding statement that on one occasion about a twelvemonth ago thousands fell from the air during a storm in Turkestan, coming down like rain in such enormous numbers as actually to extinguish a fire at a traveller's bivouac.

Our last representative of the Hemiptera of this part of the pond is called *Naucoris cimicoides* (Fig. 1), it is a flat-

Fig. 1.—Naucoris cimicoides.

tened creature of oval outline, with a *very* sharp beak which it is not at all slow to use, making its unwary captor drop it in most startled fashion under the impression that a severe wound has been inflicted. However, the pain is only temporary, the weapon being merely a piercer and not really a sting.

In all these insects, it appears at first sight as though the antennæ are wanting; this is not, however, really the case. The organs in question are very short, and concealed in depressions behind the eyes; hence the name Cryptocerata, hidden-horns, by which this particular section of the water-bugs is distinguished.

(*To be continued.*)

PYRAMID PROPHECIES.*

By RICHARD A. PROCTOR.

WHEN one has the worst of an argument abuse is a convenient refuge. Yet anger is an admission of inferiority. I take it as in this sense significant that Professor Smyth in his new Pyramid book should be angry with me for my little work on the Great Pyramid, the more so as he assigns for a reason of his anger a non-existent cause. From several quarters, he says, he has heard of my accusation that he "had discreditably brought out results for the Great Pyramid by what schoolboys call the method of fudge." But he conveniently fails to find in my book the passage which, perhaps, some pyramidalists *have*, after their fashion—that is, carelessly—referred to. If he had found the passage, or finding it had read it, or reading it had cared to acknowledge what he had found and read, he would have had to admit that I have given him no such cause for anger as he pretends.

Of course Professor Smyth adopts the convenient argument that as I have made no independent scientific measurements at the Great Pyramid, I can have no right to express an opinion on the plan and purpose of that structure. The argument involves rather a bull, implying as it does that his own measurements are not trustworthy. And certainly this is so far right that Mr. Petrie's later measurements show Professor Smyth's to have been in many respects erroneous, and his whole system of pyramid interpretation unsound. Of course the idea that none should discuss the Pyramid problem except those who have themselves measured the Pyramid, is about as absurd as would be the notion that no one who had not himself taken part in building the Pyramid can be competent to express an opinion about its plan and purpose. But Professor Smyth has proved by no means so jealous of opinions expressed by men who had not measured the Pyramid when those opinions have chanced to agree with his own views—that is with the new Pyramid religion. He rather earnestly patted me on the back for instance when he found a remark in the first edition of my book on the Sun, apparently supporting his pyramid notions.

Professor Smyth is indignant with me for charging on him (really on others) the invention of a new religion. I should be sorry indeed to have rashly or wrongly attributed to any what Professor Smyth indignantly repudiates. Those however who read his last book on the Great Pyramid, luckily a little book, and find him there speaking of John Taylor's sacred theory of the Pyramid, saying further that it is the "pillar" and the "altar" of the Old Testament, "the sign and the witness of the Lord of Hosts," "built according to divine inspiration," and so forth, will take this indignant repudiation for what it is worth. "And why did Mr. Proctor ever write his book?" asks Professor Smyth; "mainly," he politely answers "to publish himself, "and who can prevent him doing that?" I will tell Professor Smyth why I published my book:—

First, I thought (and think) that I have recognised the

* "New Measures of the Great Pyramid, by a New Measurer." By C. PIAZZI SMYTH. (Rob. Banks: London.)

real object, outside the great tomb purpose (undoubtedly a most important one in the builders' eyes), with which the Pyramid was built. The idea of stellar influences which may be foreseen and in a sense ruled, the thought indeed which underlies the system of astrology—was undoubtedly most powerful among men, an important part even of their religion, in the time when the Pyramids were built. It was second only, if second at all, in its influence on men in Egypt to that belief in the return of the body itself to new life on earth which led to the elaborate system of entombment prevailing among the Egyptians and among other ancient races. By combining these two ideas, of whose amazing importance with the Egyptians we have the clearest evidence (the very survival of those ideas to the present time is proof of the intense vitality they once had), we are able to account for almost all that is known about the Great Pyramid and its fellows in the land of Egypt. Thus Egyptologists on the one hand and students of ancient astronomical and astrological ideas on the other, have expressed approval of the way in which I have dealt with this problem, though of course the exact weights which I have attached to the tombic idea on the one hand and the astrological idea on the other, have not been regarded as necessarily accurate (no one knows better than I do myself, how much doubt hangs over this particular point). On both sides my discussion of the subject has been regarded as original, though necessarily I have had to employ and consider facts and measurements collected by others. (Among these others none are oftener mentioned with words of praise and gratitude than the pyramidalist who is so rude towards myself: but that is as natural as his rudeness, seeing that *I* felt I had a strong case and had no occasion to abuse the attorney for the other side.)

But secondly, I had a good reason for publishing my argument in the strong dislike I felt for the pernicious teaching underlying Professor Smyth's pyramidal theory. If I had the way of thinking and expressing myself which is in vogue with persons of his turn of mind, I should call his doctrine wicked and blasphemous,—though of course there is neither real wickedness nor real blasphemy in it. His intention is good enough, and real blasphemy (speaking namely with contempt of that which one *knows* and *feels* to be sacred) may be regarded as in truth an impossible sin—and in that respect (only) unforgivable. But consider. These pyramidal persons assume first, or assert as proved (it is the same thing considering the entire absence of evidence) that the Great Pyramid is a work of inspiration, a holy book in stone. They denounce as irreligious all who reason about it on the assumption that *this* at least is unproved. We find in it, as in the Zend Avesta, the Koran, and other books respecting which similar assumptions have been made, many things to admire. Without wishing to play at all upon words, I may say that there are many fine passages in it. But we find also very much that is coarse and has become mere rubbish. We find much to show that the architects and builders were men of very able and scientific minds, but much also to show that the plans they thought of were exceeding cumbrous and costly. And we *know this* that the building of the Pyramids was a work carried on in utter contempt of the lives and happiness of tens of thousands of unfortunate men, women and children (the misery of the women and children we may take for granted though history speaks only of the toils, suffering, and deaths of the men *expended* in this most cruel and utterly selfish work). For men who believe in God as All wise and All merciful as well as Almighty, who believe in Christ as himself God and *know* that he taught mercy and love to the poor and wretched—saying Come unto me all ye that labour and are heavy laden and I will give you rest,—for such men to say that God Himself enjoined on men this cruel and brutal work, that the building by which tens of thousands of lives of poor and wretched men were ruthlessly wasted was erected by divine inspiration to symbolise the coming of Christ as the greatest of all human events—this would be wicked if they knew their meaning, it would be blasphemous if they understood that pride and selfishness and cruel persecution of the poor can never have been enjoined by divine inspiration. That they should further imagine the Almighty, besides being a cruel Egyptian despot, to be so strangely minded as to plan prophecies on the particularly preposterous and inane system they attribute to the Pyramid-builders, would be a smaller matter—it would be but adding insult to the injurious things they allege of Almighty wisdom, did they but think what they are really saying. But the God they insult is only a wooden idol they have made out of their own heads. They can be justly accused of neither wickedness nor blasphemy, seeing that they but imagine the Almighty to have builded no better than *they* know. Others than they have pictured God as unwise, unjust, and cruel; others than they have made God after their own image; and others than they have denounced those who reject such hideous idols.

Let me turn lastly to less serious thoughts.

Many hoped that we had heard pretty nearly the last of the Great Pyramid prophecy craze when the year 1882, with its Pyramid-predicted world-end, had passed, and the world still rolled on regardless. But those who remember how Cumming and others of his sort kept continually offering new dates after each last year of the world had passed without the promised end,—how for the "last" year we heard of the "very last," and then of the "last of all," and yet again of the "very last of all," and after that of "really and truly the very last," will not wonder if the chief priest and prophet of the Pyramid Religion is not a whit disconcerted by the existence of the world after the fateful year 1882. That he did then expect the end of all things he showed by the outburst of enthusiasm with which he welcomed the great comet as the messenger of the end. But he is content now with small mercies in the way of world-ending. The Egyptian troubles which most of us have regarded as an emphatic nuisance—as rather contemptible (though annoying) than really important, are regarded by Professor Smyth as the beginning of the end. "Let us, I say," says the Chief Priest of the Pyramidal Religion, "examine and see whether the year 1882 A.D.—though only the beginning of the interval appointed for the Grand Gallery's southern termination to symbolise,—viz. A.D. 1882 to 1911 A.D." (there is some hope left for the poor world after all)—"did pass away so very quietly." And then he finds that (i.) such a man as Arabi and such trouble as he caused had not before been known! (ii.) the massacre of Alexandria was a marvellous event! (iii.) the guns used in Alexandria were very large! (iv.) an immense army of no less than 50,000 Britons went to Egypt! (v.) more Egyptians were bayonetted at Tel-el-Kebir than British bayonets had ever bayonetted before!* All which sends Mr. Smyth, "for one," he says, "hungering and thirsting to know where we are and what next" . . . . "to study the nineteenth chapter of Isaiah, where there are 'inspired sketches' of these last days and their particular bearing on Egypt and British Israel." For it appears we

* Professor Smyth might have added that many died in 1882 who never died before! It would seem almost as though our officers at Tel-el-Kebir might have urged on their men as Sir Charles Napier did his, "Charge yon d—— rascals and fulfil the prophecies."

are the Lost Ten Tribes. But when these baleful Israelites are brought on the scene, common sense is apt to disappear as completely as the ten tribes themselves. *Sauvons-nous!*

THE MORALITY OF HAPPINESS.

By THOMAS FOSTER.

CARE OF OTHERS AS A DUTY.

(*Continued from page* 392.)

IT remains lastly to be noticed that as there should be thought for others, and for the just rights and interests of others in the family, in the society with which we are directly associated, and within the race or nation, so there should be a wider altruism having regard to the rights of other races and nations. Hitherto men have scarcely at all recognised this duty. Very gradually the sense of altruistic duty passed beyond the family to the community of families, and thence still widening to the nation formed of such communities. Men learned that as personal selfishness is in the long run opposed to the true interests of self, so family selfishness is only a degree less pernicious. The selfishness of parochialism was in turn seen to be mischievous, though it is still prevalent enough. But the selfishness of what is called patriotism—though it is as unlike true patriotism as personal selfishness is unlike due and wise self-regard—still remains as a virtue in the minds of most men, though characterised by inherent defects akin to those which belong to personal, family, and parochial selfishness. Men fail, indeed, to recognise any selfishness in undue care for what is called a man's own country—though with but vague and indefinite meaning. Nay, a blind love of country is regarded as something so directly the converse of selfishness, that Sir Walter Scott speaks of the absence of this sort of patriotism as simple selfishness. After asking if the man lives with soul so dead as never to have said to himself "this is my own, my native land?" he goes on to say that such a man, a "wretch concentered all in self," can be swelled by no minstrel music, and is bound to go unmourned and unsung to an unhonoured grave. The idea that patriotism could under any circumstances be exaggerated, and become but a widened form of selfishness, would doubtless have outraged utterly Scott's sense of the fitness of things. Yet viewing matters from the outside, and as far as possible independently of inbred ideas, there is nothing except its wider range to distinguish the selfishness of exaggerated patriotism from personal or family selfishness.

That patriotic selfishness is mischievous in its effects would scarcely need showing if men were not so ready as they are to be deaf to the teachings of experience. The wellbeing of other nations is in the same sense essential to the wellbeing of our own nation as the wellbeing of other members of the body social is essential to our own personal wellbeing. The misfortunes of any nation with which our own has relations are misfortunes to our own nation, however they may be brought about, whether by internal misgovernment, by the attacks of other nations, or by our own warlike measures. There can be no doubt, for example, that the loss incurred by Germany, the victor, was only less than the loss incurred by France, the conquered, in the disastrous Franco-German War. Other nations suffered greatly, but Germany more, and France most of all. In the war with Russia in 1854-5, all Europe suffered. In the American Civil War not only all the United States but the whole world incurred loss. It is easy for nations to blind themselves, nay most nations are naturally blind, to the losses suffered by each through the misfortunes of others. But there can be no doubt about the actual facts. The British race would have been taught the lesson long since if the lesson could reach the average national mind through experience,—for we are suffering, have long been suffering, and long must suffer from the energetic efforts of our "imperial" race to get the better of other races. Directly and indirectly, in loss of blood and material, in the paralysis of trade as well as in increased expenditure, our people has to pay for its imperial instincts, just as the man of overbearing, hard, and selfish nature, has to pay in many ways for the gratification of his instincts imperious. There are the same reasons based on material profit for inculcating just and considerate dealings between peoples as there are for encouraging just and considerate dealings between man and man. But at present nations delight in proclaiming themselves selfish and overbearing; the more brutal instincts which remain dominant in nations after they have begun to die out in individuals, are upheld as virtues, much as in old times many races regarded the more brutal qualities of humanity as chief among the virtues.

And now it remains only that we should sum up the lessons of that morality which has as its basis the increase of happiness. This we propose to do very briefly in another short chapter, which will appear in KNOWLEDGE a fortnight hence, and close this series of papers.

(*To be concluded.*)

THE PROBLEMATIC SATELLITE OF VENUS.

UNDER the above title Mr. J. C. Houzeau has an interesting article in "Ciel et Terre," May 15, 1884. He states that seven times since the invention of the telescope a small body, presenting the same phase as Venus, has been observed by the side of that planet. The appearances were transitory, and by the next day the little star had often vanished. Four years ago M. Houzeau suggested that this supposed satellite of Venus might be an intermercurial planet, but for reasons which he mentions in detail he has abandoned that opinion. The elongations of the little star are too great for it to be within Mercury's orbit.

By comparing the accounts of the various appearances a period of a little less than three years seems deducible, and he thus sums up the matter:—"Here are two bodies, one relatively large, the other described as much less, and at approximately fixed periods they are found side by side, but as they are separated in the intervals, it is not a question of a real satellite. The two bodies follow paths which bring them together at certain periods. Their paths are near each other the whole way, for conjunctions have been observed at different points of the orbit of Venus, before and behind the sun, and to the east and west of the planet. M. Houzeau names the mysterious body Neith, after the goddess at Sais, "whose veil no mortal has removed." He thinks Venus and Neith come into conjunction about once in 1,080 days, 2·96 years. Neith goes either slower or faster than Venus, and, after having gained or lost a revolution, finally finds herself in the same longitude with the latter." Five revolutions of Venus seem equal to four of Neith, and the irregularities which affect the little body of Neith are not noticeable in the larger planet.

It appears that on Feb. 3, 1884, at six in the evening, M. Stuyvanert, Astronomer of the Brussels Observatory,

saw a very brilliant point on the disk of Venus, which reminded him of the aspect of a satellite of Jupiter on the disk of that planet. On the 12th of the same month M. Niesten saw a little star, seemingly composed of a nucleus and a feeble nebulosity, near Venus, a little to the south. Were these appearances of the problematical planet? M. Houzeau regards Neith as a sort of escaped satellite of Venus, and says, "if we could remove the moon a little from the earth and place it at a given moment in opposition, it would cease to circulate round our globe, and make its revolution, as we do, round the sun."

INDIA AS A SOURCE OF FOOD SUPPLY.

BY PERCY RUSSELL.

TO some persons, perhaps, having but vague ideas of India, related chiefly to superabundant population and periodic famines, it may sound strangely to cite India as among the future sources of our food supply. In reality, however, a very considerable section of that vast peninsula of Asia is fully capable of furnishing this country with even a greater quantity of bread-stuffs than is likely to come from Australasia for a long time yet; and all who do business in Mark Lane know that Indian wheats, especially the variety designated as Bombay white, command good prices, and are in much request. Then, India, in round numbers, is fully a thousand miles nearer England than Australia, and the necessary agricultural labour, so difficult to obtain at the antipodes, is there abundant, and needs but proper organisation to very greatly multiply the out-put of food-stuffs, which would be very welcome indeed in the markets of the United Kingdom. As to mere density of population, I believe much popular fallacy exists on that head, for while in England and Wales there are at present 437 persons to the square mile, in British India the number is but 210; and decidedly the average Hindoo consumes far less in bulk and variety in the way of food than does the average Briton. British India includes an area of, in round numbers, 1,500,000 square miles, and has a population generally computed at about 190,000,000. As long ago as 1872, the grain and pulse exports reached the value of £4,865,748, and during the decade this has very greatly augmented. Of late years, too, much has been successfully accomplished in the way of systematic irrigation, and this, conjoined to the stimulating influence of better training in an industrial sense, for the masses of the natives, is already having a happy effect in increasing production. It is, however, to the Punjaub that we must immediately look for a considerable expansion of the cereal resources of this country beyond the seas. As is generally known, the Punjaub (derived from two Persian words signifying five rivers) is the famous Pentapotamia of the ancient Greeks, and comprehends a truly enormous area in the north-west of Hindostan, which is fertilised in an extraordinary degree by the Indus and its five important affluents, known respectively as the Jhelum, Chenab, Ravi, Beas, and the historic Sutlej. The total area of this rich region is reckoned at about 200,000 square miles, and the population here is computed to be 17,611,498, or 173 to the square mile, which is less than that of France, 183. The "communications" are good, the roads being estimated at 20,789 miles. The country, roughly speaking, is divided into five tracts, termed *doabs*, corresponding to the rivers giving the distinctive name to the whole region. The soil, wherever watered by natural or artificial means, is very fertile, and competent authorities believe that the whole of this great territory might be rendered extraordinarily productive. Among the normal crops now raised, wheat, of excellent quality, occupies a foremost place, and in addition thereto, we have sugar, cotton, buckwheat, rice, barley, millet, maize, and a great variety of vegetable productions. It is a region always renowned for its fertility whenever the inhabitants have been left in peace, and includes the very ground traversed by Alexander the Great, and subsequently by Tamerlane, Mahmoud of Ghizni, and other Asiatic conquerors. The railways are now being rapidly developed, and wherever this is the case, agriculture undergoes a corresponding amount of progress. The native producers cease to limit their industrial efforts to the raising of what can be locally consumed, and new commercial relations are born which are, in themselves, fraught with widely-spreading good, independently of their natural effect in increasing the out-turn of marketable produce.

Of our important and now fast-extending tea plantations in the North-west, it is not necessary to speak at length. Year by year these are gaining prominence, and in the face of future difficulties with the Chinese—no unlikely contingency—it is well to have in reserve our own tea farms, as we have in the south our own coffee plantations. And this leads me to refer to Ceylon, in itself but an adjunct to the vast peninsula, and yet a fair type of the general productiveness of our Indian dependencies. It may well be said *ab uno disce omnes*. The island of Ceylon is in area about a quarter the size of Great Britain, and in general physical features and the almost spontaneous character of its productiveness, ranks high, if not among the very first, of our great food-producing sources. In many respects, indeed, Ceylon is an analogue of Southern India, which it greatly resembles in its flora, while the climate is, on the whole, much more agreeable and more favourable to general agriculture, owing to the rainfall being so ample that, except in the north of the island, irrigation can be virtually dispensed with. The population is only something over the half of London and its suburbs, and, as may readily be imagined, there is here an abundance of all the necessaries of life. At present, the great staple product is coffee, of which the exports now exceed two millions sterling in value, and bid fair to increase. Cocoa is also produced in considerable quantities, together with rice, cinnamon, cinchona, and other tropical vegetable products. Railways have now been built from Colombo to Kandy, and in several of the principal coffee-growing regions, while in no part of India, perhaps, are the roads in a better state of general repair. Owing to the peculiar geological formation of the island, there is such a diversity of climate that a very wide range of culture is open to the systematic agriculturist, and among other recent successes in experimental planting, that of tea-growing must be noticed. Labour is abundant, and, taken all in all, Ceylon is quite an ideal region for the profitable production of enormous quantities of vegetable food-stuffs, while its exceptionally good maritime position is bringing the island and its agricultural wealth year by year into greater importance. If I may venture on such a comparison, the importance of Ceylon may be best understood by supposing that the whole of Scotland were farmed somewhat on the plan of the late Mr. Mechi, and about three-quarters of its products available for England and Wales. Of course, the question of ocean freight interposes here and seriously affects the comparison, but we live in times when the corners of the world are being knit more and more closely together by the

agency of steam; and who can tell what new motor may not be found practicable by science to still further reduce the ocean distances between England and her great productive colonies to mere geographical expressions?

This as it may be; Ceylon must even now rank respectably as one of the sources of our future food supply, and it is well to remember that the Assam and Bengal tea plantations now send us annually full 50,000,000 lb. of that indispensable herb, which is actually in excess of the entire amount that we imported from China in the year 1832. Subsidiary to India and Ceylon, too, there is British Burmah, having a coast-line of 900 miles and an area computed at 88,550 miles, being about the same extent as Great Britain. The whole country is, in a vegetable sense, luxuriant. Palm-trees abound, and the cocoa might be almost indefinitely multiplied. The wood-oil tree, a very singular production, yields from a single trunk as much as forty gallons of good oil in one season, while that delicious fruit, the mango, rears its food-laden boughs to the height of 100 ft. Rice and wheat grow prolifically, and, wherever cultivation has once been properly systematised on the modern scientific plan, the crops are extraordinary. The population is only, in round numbers, about two millions and three-quarters, which is very much, in regard to density, as though the population of London proper were distributed over the whole area of the United Kingdom, the undisputed and sole possessors of those realms.

LIEUT.-COLONEL W. HOPE, V.C., sends us a communication which is remarkable in more than one point of view. Truly, proceeding from the pen of an officer of his eminence, his trenchant indictment of the Ordnance Department is of interest to every man of science, as it unhappily is to every taxpayer in the kingdom. That the Woolwich guns have all been more or less failures no one outside of a certain charmed circle will attempt to deny. It is only within the last two or three weeks that a 100-ton Armstrong gun burst at Gibraltar at its very first round! Now Colonel Hope is the inventor of a new form of gun, which he has offered to the War Office, and with reference to which it may suffice to say here that he guarantees that one of his guns weighing 7 tons, and 18 feet in length, shall develop an energy per inch of circumference of projectile in excess of that developed by the 38-*ton* Woolwich gun, with the maximum Service charge, *i.e.*, 160 lb. of powder, and a projectile of 818 lb.! He is informed, in reply, that he may, if he likes, try the gun at his own cost and charge, and that if such gun should fulfil every one of his allegations and save 80 per cent. in weight and 60 per cent. in money—well then, in effect, that he may take it away again. Colonel Hope is by no means an unknown man. He did valuable work in the Crimea, he invented the form of Shrapnell shell now in use, and has been thanked more than once, for scientific work done, by the Secretary of State for War. His pamphlet contains allegations which demand immediate investigation in Parliament. We presume (although we speak without authority) that it may be obtained by addressing the author at the Army and Navy Club.

THE praiseworthy efforts to provide innocent amusement and instruction for the poorest of our London toilers, and, by furnishing the masses with recreation more or less intellectual, to wean them from the potshop, continue to be made by the Committee managing the Royal Victoria Coffee Hall, the quondam, "Queen Victorier's Own Theayter" of the immortal "Mrs. Brown." Penny Science Lectures form a leading feature in the programme of this institution, and are given every Tuesday evening. On Tuesday, 17, Mr. W. P. Bloxam discoursed upon "Explosives," a subject of painful personal interest just now to dwellers in the metropolis. On Tuesday evening next, the 24th, Mr. Arthur Nicols will lecture on "The Dog as the Friend of Man," to be followed by a vocal concert. Entertainments of a less scientific character are announced for to-night (20th) and to-morrow night (the 21st). As all this is perforce carried on at a loss, an appeal is being made for annual subscriptions. Some of the sovereigns which find their way to provide the infant savages at Borioboola-Gha with moral pocket-handkerchiefs and the like might with advantage be diverted to the civilization of the heathen in our very midst. The Hon. Secretary, Miss Cons, Surrey Lodge, Lambeth-road, S.E., will be very glad to receive either subscriptions or donations.

THE INTERNATIONAL HEALTH EXHIBITION.

IV.

IN continuation of our remarks upon the "Doulton Section," we shall now give a brief sketch of some of the most important exhibits therein contained, and to that end a careful examination will be found necessary.

A reference to Fig. 5, in our last communication, will show the reader more graphically than any mere written description, to what departments of the pavilion we would direct his attention, when we speak of the annexes marked "stoves" and "bath-room."

In the area devoted to stoves and fireplaces, the most obvious advance made here, and one which would attract the attention of the most casual observer, is that of the

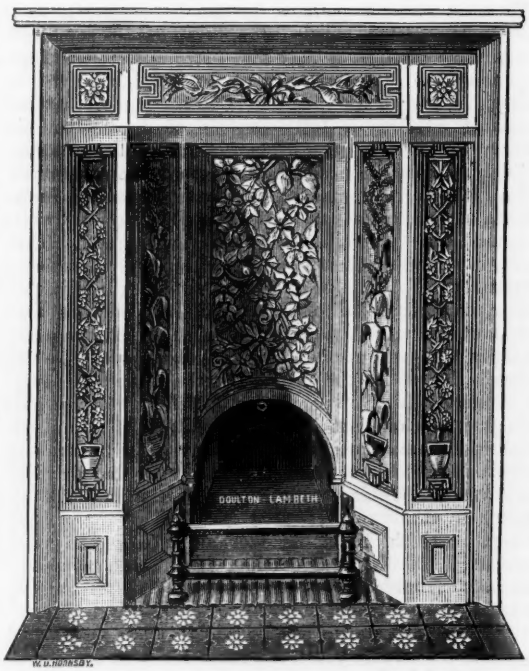


Fig. 6.

artist. A singularly novel and pleasing effect is produced by the adaptation of Doulton ware, with its beautiful colours and enriched designs, to this essential department of household economy. But to gain an exact idea of its beauty, one ought to repair to the rooms beneath the central dome, and there view it amidst what we might term its natural surroundings. Then, too, it does not require much persuasion to convince one how much cleanlier pottery-ware is than the ordinary iron which has hitherto been so largely used in the construction of fireplaces and stoves, and which entails a periodical application of black-lead. So much for the general appearance of these articles, an engraving of one of which is here inserted (Fig. 6), as a fairly typical example.

The greatest importance, however, must always be attached to improvements of a sanitary nature, and these may be classed under the headings of "materials" and "design." The character of the glazed stoneware effectually prevents an undue absorption of heat, whilst radiation is secured, and the utmost benefit thus derived from a given

quantity of fuel. The stifling hot air emitted from iron, and especially from iron stoves, is also avoided. Oxidation, too, and the formation of noxious gases and other compounds become impossible. The only metal used in the structure consists of a few fire-bars of enamelled iron. We consider this to be of the utmost importance, and, therefore, have no hesitation in strongly recommending Doulton ware for these purposes, to all architects and others who desire to keep pace with the progress of modern times in the construction of healthy dwellings. Besides, the durability of the material (it is not liable to chip) ought to commend itself.

Under the title of "design," as bearing upon health, provision is here made for the circulation of the heated air through a system of passages and outlets into the colder atmosphere of the room. The fuel is placed upon a fluted hearth of fireclay, and the advantages thus obtained are a prevention of too much escape of heat up the chimney, and the utilisation of fuel. The fluted hearth-stone is so constructed as to permit of adequate combustion without waste of fuel.

During the summer months the fire-bars may be readily removed, and a suitable flower-box, with plants to match the fireplace, substituted. A summary of the improvements secured by these fireplaces would describe them as sanitary, cleanly, durable, and highly ornamental. Moreover, they can be easily fixed to existing chimney-pieces.

A large variety of open fireplaces, open and close combined stoves, close stoves, and gas and petroleum stoves, all based upon the principles of structure detailed above, may be seen at the annexe marked "Stoves" in Fig. 5. Fig. 7 represents a sectional view of the structure of one of these stoves.

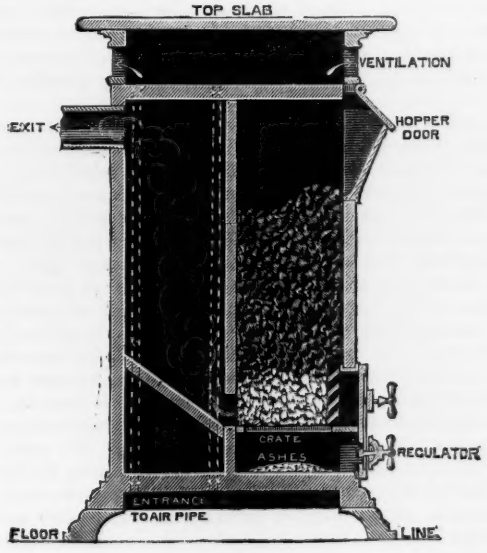


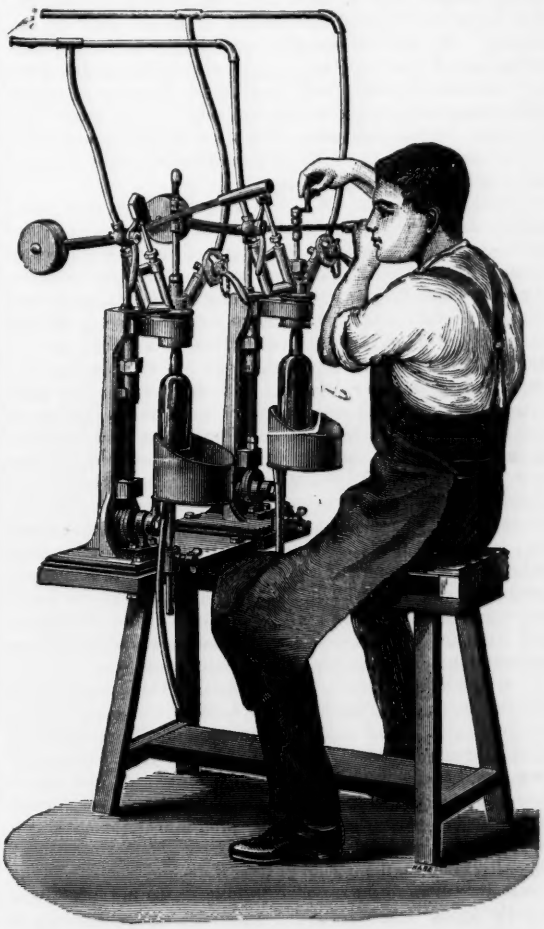
Fig. 7.

In the division allotted to bath-room furniture, an excellent full-sized bath may be observed. The form of its basin, the stoneware material of which it is made, even its white colour, are all items which have taxed the ingenuity of the inventors in the production of an article which leaves nothing to be desired. It is our opinion that as baths and bathing are symbolical of cleanliness, so the appurtenances used should be constructed of materials and in colours where dirt of any sort can be immediately detected and removed, and such happens to be the case in the instance now before us.

Next to cleanliness, economy ought to receive attention, and the waste of water, which becomes a serious drawback in large establishments, and in houses far removed from liberally-supplied districts, should be suitably provided against. This is effected by Messrs. Doulton in the hot and cold water-tap of the bath. The movement which serves to let in water simultaneously shuts off the waste-pipe, and *vice versâ*. Lastly, the instrument may be fixed on to any bath.

In our next contribution we propose to give a description of the highly interesting and valuable inventions which are being exhibited in the spaces devoted by Messrs. Doulton & Co. to filters and sanitary ware.

In the second article of this series, which appeared in KNOWLEDGE a fortnight since, Fig. 4, on page 417, was



inserted in error. The illustration herewith, representing Messrs. Barnett & Foster's machine for bottling aërated beers, should have occupied its place.

As the result of crossing between fire-signal and electric-light wires in Louisville, Ky., recently, over 300 alarm-boxes were wholly or partially destroyed, besides placing the central offices in total darkness, the connections having been melted.

MOVED FROM AFAR.*

(*Continued from page* 439.)

IV. — THE INTELLECT.

THE first instance is from a lady who requests us not to publish her name. We learn from the friends with whom she was staying that they "remember the circumstances perfectly well."

"On the 5th of November, 1855, when I was staying at a country house with several friends one wet November day, we amused ourselves by reading aloud, of which I did a large share, but was so overcome by the impression that a very dear brother was drowning, that ice had broken, and that he was drawn under it by the current, that I could not at all follow the purport of the book, and when alone, dressing for dinner, could only control my distress by arguing that there could be no fear of ice accidents, as the weather was exceptionally mild at that time. We afterwards learned my brother had been in very actual peril, having jumped into a canal dock to rescue a companion, who, being shortsighted, had fallen in in the dusk of the evening. My brother was then an undergraduate at Cambridge, and I was in Wales. He received a medal from the "Humane Society," and a watch, &c, from the members of his college, in recognition of the act. I have never had any other similar impression of death or danger to any one."

The next case is from Mr. Robert Castle, estate agent to many of the Oxford colleges:—

"Oxford: Oct. 13, 1883.—In the years 1851 and 1852, when I was from fifteen to seventeen years of age, I was left in charge of a considerable extent of building and other estate work at Didcot, Berks, at which some fifty or sixty men were employed; and for so young a person a good deal of responsibility was put upon me, as I was only visited occasionally, about once a fortnight on an average, by one of the seniors responsible for the work. Occasionally, this senior was my brother Joseph, about eight years older than myself, and who had always taken, even for a brother, a very great deal of interest in my welfare, and between whom and myself a very strong sympathy existed. I was very rarely apprised by letter of these visits, but almost invariably before my brother came (sometimes the day before, at other times at some previous hour on the same day) it would suddenly come into my mind as a quite clear and certain thing, how I cannot say, that my brother was coming to see me and would arrive about a certain hour, sometimes in the morning and sometimes in the afternoon, and I cannot remember a single occasion on which I had received one of these vivid impressions, on which he did not arrive as expected. I had, without thinking particularly about it, got to act upon the faith of these impressions as much as if I had received a letter, and the singularity of the occurrence was not brought very forcibly to my own mind until one day when the foreman asked me to give him instructions as to how a portion of the work should be carried out, when I answered him quite naturally, 'Oh, leave it to-day. Joe will be here about four o'clock this afternoon, and I would rather wait and ask his advice about it.' The foreman, who had access to my office, and usually knew what letters I received, said, 'Perhaps it would be as well; but I didn't know that you had received a letter from Oxford.' I had to explain to him that I had not received a letter, and that it was merely by an impression I knew my brother was coming, and upon this I got a hearty laugh for my credulity. As my brother turned up all right at the time named, the foreman would not be convinced that I had not been playing a trick upon him, and that I had not received a letter and put it away, so that he might not know of it. The strangeness of the matter then induced me to arrange with the foreman always to let him know, as soon as I might have the opportunity, on the occurrence of these impressions, so that he might check them as well as myself, and he, although he gave up all attempts to explain the singularity of the thing, came afterwards to trust the certainty of their being right as much as I did myself. I told my brother of them, who was very much puzzled, and could not account for so strange an occurrence; but on comparing my statements as to the time when the impressions occurred to me, in a number of cases, he said that, so far as he could check the time, it would seem to have been always at or about the time when he first received his instructions, or knew of the arrangement having been made for him to come. As both the foreman and my brother have been dead for some years past, I have no means of comparing their recollections of these matters with my own. Perhaps I should add that my brother was living at Oxford at the time, ten miles or so from Didcot, and that although I was visited from time to time by other gentlemen beside my brother, I cannot remember having had these previous impressions in any case except his.—ROBERT CASTLE."

In all these cases the idea conveyed to the percipient, though it doubtless involved a faint sensory image and had a certain amount of emotional colouring, was at any rate abstract in so far as it was the idea not of an object, but of a *fact* or *event*. The following account presents an interesting contrast in the total absence of an emotional element, while the idea transferred was of the most unpictorial kind. Mr. Keulemans, a scientific draughtsman, of whose accuracy as a witness we have had several examples, has experienced so many of these coincidences that, even before our inquiries quickened his interest in the matter, he had been accustomed to keep a record of his impressions—which, as he informs us, were invariably justified by fact:—

"In the summer of the year 1875, about eight in the evening, I was returning to my home in the Holloway-road, on a tramcar, when it flashed into my mind that my assistant, Herr Schell, a Dutchman, who knew but little English (who was coming to see me that evening), would ask me what the English phrase 'to wit' meant in Dutch. So vivid was the impression that I mentioned it to my wife on arriving at my house, and went so far as to scribble it down on the edge of a newspaper which I was reading. Ten minutes afterwards Schell arrived, and almost his first words were the inquiry, 'Wat is het Hollandsch voor "*to wit?*" (The words scribbled on the newspaper were not in his sight, and he was a good many yards from it.) I instantly showed him the paper, with the memorandum on it, saying, 'You see, I was ready for you.' He told me that he had resolved to ask me just before leaving his house in Kentish Town, as he was intending that evening to do a translation of an English passage in which the words occurred. He was in the habit of making such translations in order to improve his knowledge of English. The time of his resolution corresponded (as far as we could reckon) with that of my impression.—J. G. KEULEMANS."

* From a paper on Apparitions, in the *Nineteenth Century*, by Messrs. Edmund Gurney and Fred W. H. Myers.

THE 5 ft. 3 ft. gauge of the Great Southern and Western Company of Ireland has enabled it to build some capital first-class carriages, with lavatory accommodation and seats convertible into beds, for its night mail trains between Dublin and Cork. The convertible seats occupy about three-fourths of the width of the whole compartment, and when turned completely over disclose soft woollen mattress and pillow, and a comfortable rug.

THE METRIC SYSTEM.*

BY PRESIDENT F. A. P. BARNARD, LL.D., S.T.D.

IN every stage of society, even the rudest, the interchange between individuals of articles of personal property has been going on from the earliest time. Very imperfect notions, however, were originally entertained of the relative value of the objects thus exchanged. The esteem in which they were held had been, of course, dependent upon their properties—but properties so widely different as those of practical utility and empty ornament. In the earliest transactions of the primitive races, articles of barter were probably transferred by tale, and number constituted the only measure of quantity. But, as advancing civilisation brought with it juster notions of economy, the desire of each individual to secure the largest returns for the labour of his hands, or for his diligence in the chase, led to closer scrutiny of the terms of every transaction of bargain and sale, and thus created a demand for the means of ascertaining, with some approach to exactness, the amounts of merchandise transferred. In some cases the questions thus arising concerned length, in others weight, and in others bulk. In regard to length, reference was naturally made to dimensions of some part of the human person, as being always present for verification. Hence the use of such measures as the foot, the ell (*ulna*, the elbow, *i.e.*, the fore-arm), the cubit (*cubitus*, of similar signification), the yard (*geard*, *gyrd*, the girdle), the digit (*digitus*, finger, *i.e.*, a finger's breadth), &c. For weight and bulk, such natural standards do not present themselves. It was necessary to adopt units arbitrary in their character; and, as the magnitude of these units would be determined by the uses they would be required most frequently to subserve in the ordinary business of life, it has happened that, though many have originated among different peoples, independently of each other, there has been everywhere an approximation to a common mean value. Thus the unit of weight has been found, for the most part, to vary between five and ten thousand English grains troy, though in a limited number of instances it has fallen outside of these limits. Similar variations have been found in the leading units of capacity. It has only been when, in the progress of enlightenment, systems of metrology have been formed on scientific principles, that units of weight and measure have been connected with, and made dependent on, units of length. In the earlier stages of society, commercial exchanges between different countries, and even between different provinces, towns, and villages of the same country, were infrequent and of comparatively insignificant importance. Each small community, therefore, originated its own system of weights and measures; and the total number of such systems simultaneously existing has always, down to the middle of the present century, been excessively great. Some idea of this diversity may be formed from an examination of the tables presented to the Society some time since, and printed in Barnard's Metric System, published in 1879 in Boston, of the values given to a particular weight and a particular measure similarly named throughout Europe and the countries colonised by Europeans, and known as the pound weight (*pondus*, or *libra ponderis*), and the foot measure (*πούς*, pes, pé, pié, pied, fuss, fot, fod, foot), in which will be found no fewer than three hundred and ninety-one different pound weights, and two hundred and ninety-two different foot measures; all, with the exception of two or three, derived from antiquity, in actual use, somewhere or another, at the close of the eighteenth century.

It was in the hope of removing the confusion, and remedying the inconvenience to all mankind occasioned by this multiplicity of the forms of expressing the quantities of exchangeable commodities, that in the years preceding the outburst of revolutionary violence in France, and while the king was still on the throne, overtures were made to the British Government by King Louis XVI., at the instance of the Constituent Assembly, inviting the appointment of a joint committee of members of the Royal Society of London and of the French Academy of Sciences, to agree upon some natural standard of length as a basis of a universal system of weights and measures. This was the first step in a movement which culminated in the adoption, on June 22, 1789, by an international commission called to meet at Paris, and composed of delegates of ten independent States, of the ten-millionth part of the quadrant of the Paris meridian, under the name of the metre, as the basic unit of a new and improved system of weights and measures. The system founded upon this base, and called therefore the metric system, has, in subsequent years, been generally adopted by civilised nations. Those which have hitherto failed to accept it are England, the United States, and Russia; but even in these countries its use has become general among scientific men.

Very decisive indications make it evident that the introduction of this system for exclusive use in all these countries is only a question of time. In Russia, the use of the system in the custom-houses was ordered as early as 1870. In 1876, an Imperial Commission sent to Paris to inquire into the operation of the system in Western and Central Europe, made on its return a favourable report. In the British House of Commons, in 1868, a Bill making the use of the system compulsory, after a time to be fixed by the Government, passed its second reading by a heavy majority, but was not put upon its final passage, in consequence of a representation by the ministry that it would be judicious, before further action, to await the report of a commission previously appointed by the Crown, to inquire into the state of the standards, and to advise as to the legislation needed in regard to them. This commission reported, in 1869, as their "unanimous conclusion," that "the best course is cautiously, but steadily, to introduce the metric system into this country." In 1871, a Bill making the system compulsory in England after a limited term of years, was again introduced into Parliament; but a number of influences conspired to make the occasion inopportune, and it was not passed to a vote.

In our own country, the permissive use of the system was sanctioned by act of Congress in 1866. Early in 1879, a report of the Committee on Coinage, Weights and Measures, of the House of Representatives, signed unanimously, recommended the use of the system in the post-offices and custom-houses of the United States; and a Bill designed to give effect to that recommendation was introduced. Unfortunately, the report was made so late as February to a Congress about to expire by limitation on March 4, and time did not allow its consideration. The States of Connecticut, Massachusetts, and New Jersey have, by their legislation, favoured the introduction of the system, and have provided that its principles shall be taught in the public schools.

From evidences like these, it must be manifest to every thinking man that a system which has already been so widely accepted as a means of regulating the ordinary transactions of business between man and man in every-day life, and which is involved in the greater part of the interna-

* From a paper on "The Metrological System of the Great Pyramid," read before the American Metrological Society, on December 27, 1883.

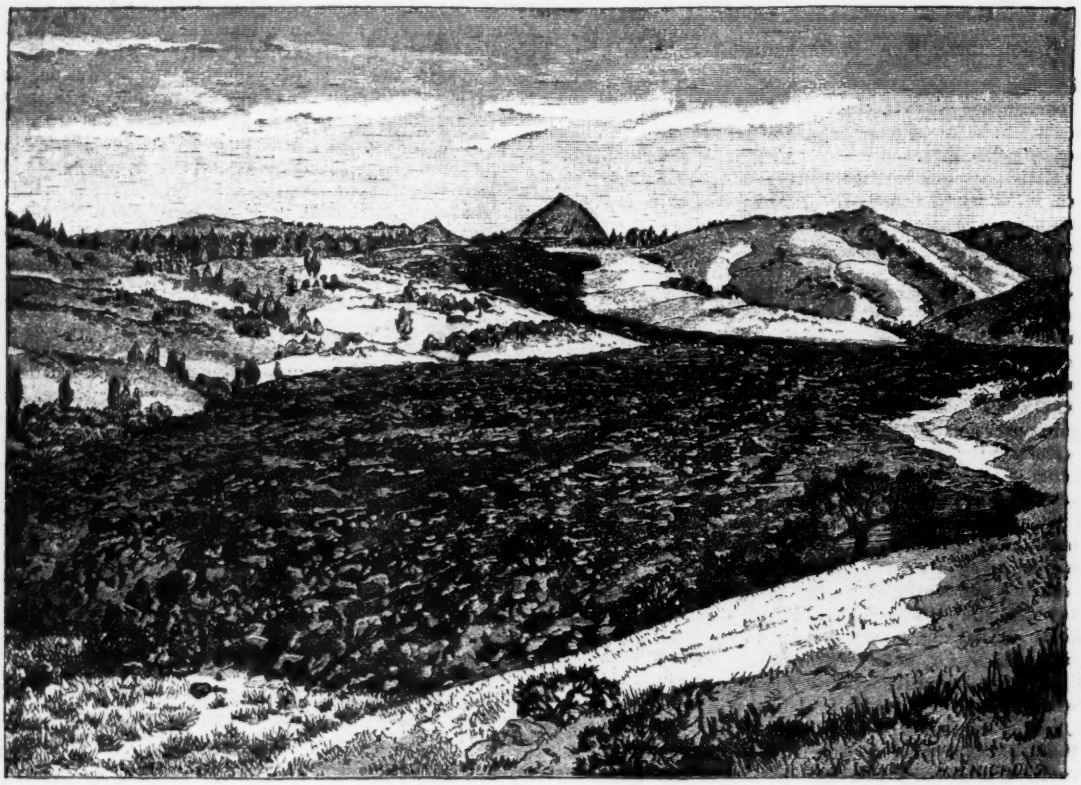


Plate XX.—Recent Lava Flow on the Uinkaret.

tional commerce of the human race, must sooner or later be universally prevalent. Some time may yet elapse before this anticipation is realised, as the absurd system of metrology now in existence among us gives token that it is not likely to die easily. In this country the opposition has even been organised, and an "Institute" has been established, calling itself "International," and professing to be designed "for preserving and perfecting weights and measures," which, during the past three or four years, has been flooding this country with its circulars, and bombarding Congress with its petitions. This agitation may not be without some temporary effect, especially in the way of scaring politicians, who are always frightened by clamour of any kind, whether accompanied by sense or not; but, in its influence upon the great and steady march of public opinion, its ultimate effect will be about equal to that produced by the honest old lady who attempted to sweep back the rising tide of the Atlantic with a broom.

THE GRAND CAÑON DISTRICT.*

CAPTAIN DUTTON'S elaborate monograph on perhaps the most imposing gorge in the world, has been thoroughly well done and superbly illustrated. The author gives a rapid summary in the twelfth chapter of the changes which have taken place and have produced the present wonderful scenic features of this region. Before the Carboniferous period thick beds of Silurian and thinner deposits of Devonian sediments were laid down, though a guess whence they were derived is not hazarded. The region was then upheaved, enormously eroded, and again submerged. Upon the eroded surface the Carboniferous rocks were unconformably deposited, and the deposition of sediment was continued until the end of the Mesozoic, resulting in the accumulation of from 12,000 to 16,000 feet of strata over the entire Plateau province. The Carboniferous deposits may have accumulated in an ocean of moderate depth, but the Mesozoic beds were all shallow-water deposits, and they sank as rapidly as they accumulated.

"Near the close of the Cretaceous, signs of the coming revolution make their appearance. The waters became brackish, indicating a restricted access of the ocean. At the close of the Cretaceous, important disturbances took place, and portions of the province were uplifted and denuded. These were again submerged, but the new conditions differed from the old, for the new deposits (Eocene) laid down unconformably upon the Cretaceous and Jurassic are of fresh-water origin, indicating that a great lake was formed. The extent of this lake corresponds very nearly with that of the Southern Plateau province itself, but not exactly. Near the Middle Eocene began that slow action which has gradually elevated the western portion of the continent, and which has prevailed until a recent epoch."

During the Tertiary, erosion went on continuously, the thickness removed from some large areas amounting to about 10,000 ft., and much the greater part of this denu-

* *United States Geological Survey.* J. W. Powell, director. Tertiary History of the Grand Cañon district, with atlas. By Captain Clarence E. Dutton, U.S.A. Washington, Government Printing Office, 1882. 4to, pp. 264. From the *American Naturalist.*

dation was probably accomplished by the close of the Miocene.

"The Colorado river appears to have originated in very early Tertiary time as the outlet of the great Eocene lake, and has persisted in its course ever since. It has been the main track along which the waste of the province has been carried to the Pacific. At its beginning its bed lay in Eocene strata, and as the land rose it cut down its channel by corrasion, severing in succession all the beds of the Mesozoic and Carboniferous systems. That portion of it which constitutes the Grand and Marble Cañons has cut through 10,000 to 16,000 feet of beds, reaching a maximum amount in Kaibab. The present Grand Cañon represents only the corrasion through the Carboniferous and into the Archæan.

Plate XXI.—A lateral Amphitheatre of the second order in the Grand Cañon.

"The older corrasion of superior beds becomes manifest only when we restore, in imagination, the Mesozoic strata which have been denuded from the vicinity of the chasm. The present Grand Cañon, therefore, is the work of late Tertiary and Quaternary time. Although we cannot fix with precision the exact epoch at which the river first penetrated the Carboniferous beds, we may, in roughly approximate language, place that epoch near the beginning of the Pliocene or close of the Miocene."

Among the more interesting points elucidated besides the gorges of the Colorado, are the basaltic eruptions of older and some of very recent date. After describing the ancient basalts of Mt. Trumbull and other masses, which are much eroded, attention is then drawn to the fields of recent basalt, which look "as fresh as any *coulée* of Vesuvius ejected twenty or thirty years ago." Plate XX. represents one of these fields. Compared with the other later eruptions of the Uinkaret, its dimensions are larger than the average. Its entire surface is covered with blocks of pumice of the most delicate kind. It has a texture very much like the lightest coke, the vesicles, however, being considerably larger than those of the ordinary coke, and very uniform throughout. The septa between the vesicles are very thin, and the whole mass is so light that when a specimen is varnished over to prevent access of water to the cavities, it floats upon water like a cork. . . . . Any attempt, however, to fix the age of the lavas must prove quite fruitless. All that we can say is, that it is very recent, even when time is judged by the historic or human standard. It cannot be many centuries old, and it may be more recent than the Spanish conquest. But there are reasons why lavas should here preserve for centuries the freshness which is lost in other countries in as many decades. The climate is arid, and there can be no question that the chemical action of the meteoric agents upon the lavas proceeds here with extreme slowness.

The volume ends with a discussion of the mode of excavation of the Grand Cañon, of corrasion and weathering, and finally with a treatment of the details of its erosion.

Not only for its full and well-written account of the geology of an extensive as well as not very accessible region, will the volume have its use, but especially as a contribution to dynamical geology, with regard chiefly to the action of running water and weathering, will this volume possess permanent value.

It is hardly necessary to add that the pencil of Mr. Holmes, whose genius for sketching geological panoramas is almost unique, has added materially to the value of the work. The woodcuts and photo-engravings are drawn in his superior manner, while the chromo-plates evince his facility in the use of water-colours.

Captain Dutton's style and mode of handling his subject is clear and elaborate, and worthy of the subject. The atlas is in Bien's best manner.

ELECTRO-PLATING.

By W. Slingo.

VI.

THE mould being prepared, it is next placed in a bath, the dimensions of which vary with the work to be performed. The most generally useful bath is a rectangular vessel, about 12 in. long by 6 in. wide and 6 in. deep. An earthenware one may be procured at a pottery or at a philosophical instrument makers. Such vessels are, however, somewhat expensive—possibly because the demand for them is small; but the impecunious student is not bound to any particular size or shape, and there are generally a number of more marketable articles obtainable which make first-class substitutes. When earthenware baths are employed, the solution exhibits a tendency to creep, but this may be prevented by applying a thin coating of paraffin or some other available material to the rim. Wood answers very well for copper solutions, if it is well put together and lined with marine glue, which is an extremely handy substance, insoluble in water and in many other liquids. To work the glue, it should be liquefied by heat, either by placing it an old can or ladle over the fire, or by laying it on the part of the vessel it is required to cover, and then passing a hot poker or any other available piece of iron over it. It is then made to run over the surface. Care should

be taken to ensure a complete lining. This bath will not be available for silver or gold solutions, because the glue would be dissolved by one of the constituents of the solution.

The anode or positive electrode in an electrotyping bath is a stout copper plate. It should be a quarter of an inch thick, for, be it remembered, every ounce of copper deposited on the mould means an ounce dissolved off the anode. The area of the plate is governed by the dimensions of the bath. An arrangement may be advantageously adopted for supporting the anode at various depths. With a wooden bath such an arrangement may be easily devised. For instance, a couple of uprights, attached one to each end or side of the bath, may be made to carry in fairly drilled holes a cylindrical rod of wood or metal with two equal strings secured at one end to the rod, and at the other end to the anode. A handle fastened to one end of the horizontal rod affords a means for winding the plate up and down. Two strings are employed to keep the anode in a constant plane. The articles intended to receive the deposit form the cathode, or negative electrode, and should be suspended in the solution from a rod of brass or copper connected by a wire with the zinc pole of the battery. If the mould is of gutta-percha or any other light material, it is necessary to twist the wire which carries it round the rod, in order that it may be kept in its proper position in the bath. Being light, there is a strong tendency on the part of the percha, &c., to rise to the surface. If the mould is of a material heavier than water, it may be simply hooked on to the rod. The solution may be prepared by dissolving in a gallon of boiling water 1 lb. of sulphate of copper, and then adding $\frac{3}{4}$ lb. of sulphuric acid. The function of the acid is to facilitate the solution of the anode, so as to keep pace with the deposition, and maintain the strength of the electrolyte. An even deposit is more likely to be obtained if the cathode is occasionally moved about, or if the solution is agitated, and a further improvement results from a solution which is maintained at a warm and constant temperature. The strength and electro-motive force of the current required depends largely on the conditions of the circuit. The connecting wires should be thick, and as short as circumstances will permit, and all connections should be bright and free from dirt. Bad contacts are, perhaps, responsible for more failures than any other possible imperfection. With a well-arranged circuit, one battery cell will generally suffice, but not more than two in series should be employed, otherwise the electro-motive force of the current will be excessive, and the deposit, although rapidly procured, will in all probability be hard, brittle, and extremely irregular. No more suspending wire than is absolutely necessary should be exposed, otherwise the anode will be wasted, and, by exposing a considerable length of wire, the electrotype may be impoverished. The mould should be as nearly parallel with the anode as possible, to insure uniform resistance, and so to provide another guarantee against a bad deposit. In an experiment which I once carried out, my mould, which was a light one, got somehow into a position almost at right-angles with the anode, and was left so for some hours. On examination, it was found that, while the part of the mould nearest the anode had received a copious deposit, the other portion was bare. This result showed up the necessity for more frequent examination and for occasionally varying the position of the mould. The anode, with some such arrangement as the one above described should, when the mould is in position, be immersed gradually, the amount of surface in the solution being increased until the deposit which commences at the copper wire has covered the plumbago. The deposit, to be good in texture and have a good surface, should be of a bright red colour. Any thickness of deposit may be obtained by leaving the mould in the solution for a sufficiently long period of time. A couple of days will, generally speaking, be found long enough, for if more substance is required than could be deposited in that time, it may be more readily and more economically obtained by filling up the back with solder, concerning which, however, more anon.

The deposit being obtained, it may be parted from the mould with the aid of the point of a knife. Should the copper have reached too far over the edge or on to the back of the mould, the superfluous metal may be filed or clipped off. It is best to first free the mould and the copy (or electrotype) by cutting the wire close up. The copy, after removal, requires annealing; but a description of this process must be deferred for a fortnight.

IT is stated that the Duke of Norfolk has intimated his intention to make a donation of £3,000 towards the expense of establishing and carrying on a technical school at Sheffield. The subscriptions previously promised amounted to more than £6,800, and the committee had intimated their intention not to commence operations until £10,000 had been raised. The Duke of Norfolk's handsome offer thus makes it certain that we shall have a school of engineering and metallurgy in Sheffield.

SAFETY LAMPS.—Two models of safety lamps have been adopted by a committee nominated by the Prefect of the Paris Police to report upon the best lamp for use in a gaseous atmosphere. One of these is an electric lamp supplied with current by an accumulator, and the other is an improved Davy lamp. The Paris firemen are to be supplied with these lamps without delay. This action of the Prefect has been taken with a view to prevent similar accidents to that which happened in the Rue St. Denis a short time since, whereby several firemen lost their lives from an explosion of gas.

AUTOMATIC LIGHTING OF BEACONS.—In America a system of automatic beacon lights has been adopted. Each beacon, says *Engineering*, is furnished with a reservoir of sheet-iron, containing gas under a pressure of fifteen atmospheres. The quantity is sufficient to light the beacon for three months; and fresh supplies are periodically delivered by a vessel which conveys the gas from the factory. A clock-work installed in the beacon turns on and lights the gas at the hour fixed for this purpose. The experience of several months has served to test this plan, and it has proved so far successful. Attendants live on the shore near the beacons, and see if they are working properly. [This system is apparently closely allied to that advocated by Mr. Pintsch.]

TELEPHONE WIRES IN BRAZIL.—The employés of the Telephone Company in Rio de Janeiro have great difficulty in keeping their wires intact, owing to the constant damage inflicted by the Aasgeier, a large vulture, which is very common in Brazil. This bird, owing to its habit of just skimming the tops of the houses in its flight, frequently comes in contact with the telephone wires, and either breaks or becomes entangled in them. It appears that there is a law against the destruction of this bird, which does useful work as a scavenger, and consequently there is nothing for the telephone people but to grin and bear it. A local paper suggests that they must wait until the Aasgeier learns to avoid the wires. The wait will probably be a long one.—*Electrician.*

THE FLOODS OF THE OHIO.—An interesting note on this subject has been communicated to the French Academy of Sciences by MM. Lemoine and Mahan. The Ohio floods, as is well known, produce great havoc at Pittsburg, Cincinnati, and other cities on the banks of the river. The river rises to a great height, and floods the houses and manufactories on its banks. In February last, more than 1,200 buildings were flooded at Pittsburg, and at Cincinnati (275,000 inhabitants) the damage was estimated at about £200,000. The basin of the Ohio has an area little less than the whole of France; and a great many affluents join the main stream. Although a few flood observations have been made on the river itself, the tributaries have been neglected in this respect. MM. Lemoine and Mahan propose to organise a methodical system of observations on the river system of the Ohio valley, such as Bellegrand introduced in the basin of the Seine. The important stations will be in communication with the engineer of navigation at Cincinnati, who will forward warnings to all places threatened with a flood. Certain stations will send daily reports by letter, others by telegraph; and the data thus collected will, when sifted out, lead to the prediction of floods at different parts of the basin.—*Engineering.*

Reviews.

SOME BOOKS ON OUR TABLE.

Natural History of the Mammalia of India and Ceylon. By ROBERT A. STERNDALE, F.R.G.S., F.Z.S., &c. (London: W. Thacker & Co., 1884).—Evolutionists may demur to Mr. Sterndale's ideas on the subject of special creations, and comparative anatomists may possibly question whether the classification of Cuvier is the most rigidly scientific one that could have been adopted. Leaving, however, such points as these for discussion by professional zoologists, we may express our opinion at once, that the work before us is the very model of what a popular natural history should be. Its descriptions are excellent, and are well supplemented by the very numerous illustrations which accompany them. Mr. Sterndale has lived among, and to no small extent made friends of, the animals of which he treats so amusingly and instructively; and his anecdotal style gives a charm to his writing which cannot fail to attract the general reader. This is a book which should form part of the kit of everyone, be he soldier or civilian, who may have occasion to visit our Indian Empire.

Earth's Earliest Ages. By G. H. PEMBER, M.A., (London: Hodder & Stoughton, 1884).—The inexorable rule which excludes all purely theological topics from these columns leaves us but scant material for criticism on the volume now before us. The chief end of Mr. Pember's work would seem to be to show that the signs of the end of the world are coming thick and fast upon us. Among these we regret to find him treating that most contemptible imposture, known as "Spiritualism," as an objective reality. He seems in the most blissful unconsciousness of the manner in which Medium after Medium has been detected in the perpetration of his (or her) clumsy cheating. He gravely sets down such miserable impostors as the Foxgirls as really in communication with the unseen world, ignoring Mrs. Norman Culver's *exposé* in a sworn affidavit, of the manner in which they performed their tricks. He speaks in faith of Mrs. Guppy-Volckmann, apparently in sublime unconsciousness of the way in which her production of "Spirit flowers" was detected at Belfast. He talks with the most childlike innocence of that respectable young woman Miss Florrie Cook (now Mrs. Corner) through whose mediumship "Annie Morgan," alias "Katie King," appeared to poor Mr. Crooks; but who was caught, *flagrante delicto* on Jan. 9, 1880, by Sir George Sitwell and Herr Von Buch. He has obviously never heard how Miss Showers was found out by a lady in the late Mr. Sergeant Cox's own house. He talks of "the mediumship of Mr. Herne"; oblivious or ignorant of the fact that Herne's partner, Williams, having quarrelled with him in Hull, turned Queen's evidence, and not only exposed the manner in which "ghosts" were raised, but gave the address of the shop in Houndsditch where the "spirit masks" were to be bought! It seems incredible, too, that Mr. Pember can, prior to writing his chapter on Theosophy, have heard how that extremely credulous and fatuous person, Mr. A. P. Sinnett, failed in obtaining a copy of the *Times* newspaper for the day, through the mediumship of one of the occult Brotherhood. Now, in this short list of detected impostors, we have confined ourselves to names which appear in the pages of the work before us. We might extend it almost indefinitely, but for the reader's sake forbear. Surely Mr. Pember is seriously weakening his case by adducing the very clumsiest cheating as evidence in illustration and corroboration of it.

Life—Function—Health: Studies for Young Men. By W. SINCLAIR PATERSON, M.D. (London: Hodder & Stoughton, 1884).—We have little, indeed, but praise for Dr. Paterson's excellent book, which might be studied with profit and advantage by every young man in the United Kingdom. With a few of its author's conclusions it seems impossible to agree. Notably is he weak in the geological part of his work; but he advances his views and gives his reasons for their adoption with commendable frankness, and we must admire his motives where we dissent from his conclusions. One great charm of these essays is that, while a scarcely-veiled teleological purpose underlies them, they are marked by an utter absence of cant, which is as noteworthy as it is refreshing. The simple and unobtrusive vein of reverence which runs through them could hardly excite antagonism in any (so-called) "Hall of Science" itself. Dr. Paterson's volume would form a present for a youth verging on manhood, of a value which would be but imperfectly gauged by the very moderate price at which it is published.

The Guild of Good Life. By BENJAMIN WARD RICHARDSON, M.D., F.R.S. (London: Society for Promoting Christian Knowledge).—Here is another book on health, which can hardly be too widely circulated among the lower-middle classes and those in the rank of artificers and the like. It purports to relate the proceedings of a "Guild of Good Life," a society established by a noble-hearted and devoted woman, the widowed daughter of a small jeweller, and a few of her working connections and friends, each of whom is supposed to give a lecture upon some division of the comprehensive subject of Health and Happiness. It would be well indeed if branches of such an association were formed in every locality inhabited by the wage-earning classes, and that as simple, practical, and valuable addresses were delivered at their meetings as form the staple of Dr. Richardson's book. The result could only be to revolutionise the aspect of the larger part of our great towns and cities occupied by working men and their families, and to bring health and comfort where dirt and squalor now reign supreme.

Thrift and Independence. By the Rev. WILLIAM L. BLACKLEY, M.A. (London: Society for Promoting Christian Knowledge. 1884.)—The matter of Canon Blackley's work is very much more interesting than his manner, which, we fear, is scarcely adapted to rivet the attention of the person who, it is most to be desired, should be attracted by it—the working-man himself. This is regrettable, because of the real and vital importance of the subject dealt with in the volume before us. In a series of chapters our author treats of the Helps to Thrift, the Hindrances to Thrift, and the Hopes for Thrift, dealing in detail with the Post-office and other Savings-banks, Government Insurances and Annuities, and the various kinds of sick and benefit clubs and friendly societies. It is saddening to read his statements on the subject of the insolvency of so large a percentage of these last-named associations. He exposes the utterly communistic and inequitable principle of the existing Poor Law, and concludes with an exposition of his now well-known scheme for a system of universal national insurance. The value of Mr. Blackley's suggestions on this subject can be hardly over-estimated, and while we would commend the perusal of his present volume to every educated man who is interested in the prosperity of the Empire, we would suggest that its chief conclusions should be summarised in some very plain, simple, and attractive form for the widest circulation among the labouring classes.

Biographies of Working Men. By GRANT ALLEN, B.A. (London: Society for Promoting Christian Knowledge. 1884.)—Mr. Grant Allen's typical working men are Thomas Telford, stonemason; George Stephenson, engine-man; John Gibson, sculptor; William Herschel, bandsman;

XUM

Jean François Millet, painter; James Garfield, canal boy; and Thomas Edward, shoemaker; and a most interesting series of short biographies he gives us. Invested with that charm of style so familiar to all readers of Mr. Allen's contributions to our own columns, and absolutely free from that "goody-goody-"ness which repels so many more readers than ever it attracts, these prettily-told life-histories of men who have risen from the ranks by their indomitable will, perseverence, industry, and energy, are certain to become popular. Here is a capital present for a lad entering upon life.

Elementary Physiology. By G. T. BETTANY, M.A. (Camb.), &c. (London: Bemrose & Sons.)—As an introduction to physiology for the use of young persons we have, so far, seen nothing to excel the capital little book whose title heads this notice. The descriptive part is written in plain and perspicuous language, and the engravings (albeit some of them are very old friends) are—what they profess to be—illustrations of the text. It is not so very long since the mother of a girl who was studying physiology in a school which shall be nameless, wrote to the mistress: "Dear Miss Carpenter, Please do not teach Mary Ann anything more about her inside. It does her no good; and besides, it's rude." Had the authoress of this singular epistle read Mr. Bettany's excellent little manual, there can be no possible doubt that she would never have penned it.

THE RHÔNE AT GENEVA.—An attempt is being made to utilise the water power of the Rhône, which crosses Geneva on issuing from the lake. A portion of the power will be used to light the streets with the electric light, and the other portion will be sold to private individuals for manufacturing purposes. The river is divided in the centre of the city into two branches by an island, and the hydraulic works will be established on the left branch, necessitating the temporary turning aside of all the water into the right branch. An exceptionally favourable winter has done much to assist the rapid progress of the work, and two dams have already been constructed, one on the upper, and the other on the lower side of the arm under process of draining; and it is thought that in a short time the pumping out of the water between the two dams will be commenced.—*Engineering.*

ELECTRIC LIGHTING.—The contract for lighting by electricity the magnificent Parliament Houses in Melbourne has been given to the Australian Electric Light Company, with whom the Australasian Company has recently amalgamated its Victorian interests. The installation will provide dynamo power for 1,350 Swan lamps, but probably only 1,000 will be needed at one time. The Australian Company has likewise secured the lighting of the General Post-office at Melbourne, which is an important sign of the progress now being made in electric lighting in Australia, where many public buildings are now fitted with this light only. A very fine display has just been made at the Victorian Inter-Colonial Exhibition, which has been lighted solely by electricity. A similar arrangement on a smaller scale was made at the recent Exhibition at Christchurch, in New Zealand, where during the whole period the building was entirely dependent on the electric light.

THE LIGHTNING ROD.—Attention has recently been called to the use of iron as a metal for lightning rods. In this country, where the subject has been left in the hands of the manufacturers, lightning rods are made of pure copper, and consequently are far too expensive for general use. In France, America, and other countries iron rods are in vogue, and found to answer the purpose very well, besides being inexpensive. In Canada a church was recently protected by a round iron rod $\frac{3}{4}$ in. in diameter, and welded at each joint. The upper end of the rod was drawn to a point, and a damp ground connection provided for the lower end. The rod was secured to the church by galvanised iron staples; the total cost was under £3. While upon this subject we may mention that Franklin was probably anticipated in his discovery of lightning conduction. According to M. De Rochas (see *La Nature*, p. 381, 1883), the ancient Etruscans understood the art of guiding the lightning. Servius relates that in ancient times the priests ignited their sacrifices by lightning, and on one occasion Tullius Hostilius was struck dead because he neglected the precautions laid down by Numa.—*Engineering.*

Editorial Gossip.

THERE is this week little room for Gossip, to which also others besides Mr. T. W. Piper may strongly object. But it is necessary to do justice, even at the risk of offending Mr. Piper (especially as I may be said to have most fully and honestly "paid the piper"). I find that my remarks concerning the way in which *Chambers's Journal* lost caste when under the management of Mr. William Chambers has been misunderstood. (The fault is doubtless mine.) I did not mean that the journal lost caste as such, but only that in its scientific character the paper lost caste. This is strictly and emphatically true. Every one of Mr. William Chambers's papers was either unsound or feeble (or both); and though some sound men of science continued to write occasional articles for *Chambers's Journal*, I know as a matter of fact that others were deterred from writing by the quality of the papers in whose company their own would have appeared. The journal itself doubtless flourished, as it thoroughly deserved. But those who, like myself, regard the narrative portions of a magazine as the "padding," recognised a decided falling-off. Of course many magazine critics failed to notice the change.

THE FACE OF THE SKY.

FROM JUNE 20 TO JULY 4.

BY F.R.A.S.

THE telescope will, as usual, be turned upon the sun on every clear day, for the observation of spots, faculæ, &c. He attains his greatest height above the horizon to-day and to-morrow; and this is a very favourable time for obtaining the meridian by means of equal altitudes. Summer is technically supposed to begin at 10 o'clock to-morrow morning. Map VI. of "The Stars in their Seasons," represents the present configuration of the night sky. There is, though, as we said on p. 421, no real night at all now. Mercury is a morning star, and may be detected with the naked eye before sunrise above the E.N.E. point of the horizon. Venus is still an evening star, but is approaching the sun. Her narrowing crest forms a beautiful telescopic object. The rest of the planets are, for all practical purposes, invisible. Two occultations of stars are visible during the next fortnight. The first occurs on the night of June 27, when 34 Sextantis, a 6th mag. star, will disappear at the moon's dark limb at 10h. 27m. at an angle from her vertex of 94°. She will have set more than three-quarters of an hour before the star reappears. The second occultation happens on July 3, and is one of the 4th mag. star ζ^1 Libræ. This will disappear at the dark limb of the moon at 8h. 57m. p.m., at a vertical angle of 144°, and reappear at her bright limb at 9h. 37m. at an angle of 205° from her vertex. The moon is in Taurus when our notes commence, and continues her path through that constellation until 8h. 30m. on the evening of the 22nd, when she enters the northern portion of Orion. By 7 o'clock the next morning she will have passed out of this into Gemini. She does not quit Gemini until 8 p.m. on the 24th, crossing at that hour into Cancer. It is 9 o'clock in the morning of the 26th before she leaves Cancer for Leo, and four-and-twenty hours later she descends into Sextans, re-entering Leo at 1 a.m. on the 28th. She completes her passage across Leo at 2 a.m. on the 29th, and passes into Virgo. It takes her until noon on July 2nd to traverse this great constellation and enter Libra, where she remains until 2 o'clock in the afternoon of July 4th. She then enters the narrow northern strip of Scorpio, where we leave her.

ERRATUM.—On line 23 of "The Face of the Sky," on p. 421, "$\frac{3}{8}$ in." should be "5·8 inches."

THE TELEPHONE IN AMERICA.—The following statistics are taken from the last report of the American Bell Telephone Company:—

	Jan. 1, 1883.		Jan. 1, 1884.		Increase.
Exchanges open.....	735	...	890	...	165
Miles of wire	69,452	...	82,879	...	13,427
Subscribers.....	97,735	...	123,533	...	25,798
Employés	3,704	...	4,777	...	1,073
Instruments	249,711	...	307,010	...	57,299
Gross revenue ...	£315,206	...	£549,119	...	£143,913

"Let Knowledge grow from more to more."—ALFRED TENNYSON.

Only a small proportion of Letters received can possibly be inserted. Correspondents must not be offended, therefore, should their letters not appear.

All Editorial communications should be addressed to the EDITOR OF KNOWLEDGE; *all Business communications to the* PUBLISHERS, *at the Office, 74, Great Queen-street, W.C.* IF THIS IS NOT ATTENDED TO DELAYS ARISE FOR WHICH THE EDITOR IS NOT RESPONSIBLE.

All Remittances, Cheques, and Post Office Orders should be made payable to MESSRS. WYMAN & SONS.

The Editor is not responsible for the opinions of correspondents.

NO COMMUNICATIONS ARE ANSWERED BY POST, EVEN THOUGH STAMPED AND DIRECTED ENVELOPE BE ENCLOSED.

MAN'S BRAIN, &c.

[1300]—(1.) In reply to Mr. Stringer Bates's questions, 1299, my authority, *inter alia*, for the statement as to the relative cranial capacity of the Englishman, the non-Aryan Hindu, and the gorilla, is the following paragraph from a paper by Professor Huxley, given in Lyell's "Antiquity of Man," p. 89 (4th edition).

"The most capacious healthy European skull yet measured had a capacity of 114 cubic inches, the smallest (as estimated by weight of brain) about 55 cubic inches, while, according to Professor Schaaffhausen, some Hindu skulls have as small a capacity as about 46 cubic inches (27 oz. of water). The largest cranium of any gorilla yet measured contained 34·5 cubic inches."

Commenting on this paper, Sir Charles Lyell remarks that "it is admitted that the differences in character between the brain of the highest races of man and that of the lowest, though less in degree, are of the same order as those which separate the human from the Simian brain," and that the statements of both Professor Huxley and Dr. Morton show "that the range of size or capacity between the highest and lowest human brain is greater than that between the highest Simian and the lowest human brain."

(2.) I cannot say what is the "deliberate" judgment of the authorities whom Mr. Bates names. That it is based on "adduced evidence" goes *sans dire*, but evidence adduced is not necessarily conclusive. In the case of Sir Richard Owen, Mr. Bates may remember a controversy between him and Prof. Huxley, in which the former came off second best, and it is well known that Sir Richard abandoned above twenty years ago his position that man should be separated as a distinct sub-class from the ape on account of radical differences in cerebral characters. The weight to be attached to the opinions of the other names cited is much lessened by their known connection with certain systems of theology, but, as I shall have occasion to refer to this in the course of my series of papers, any details need not here be entered into.

EDWARD CLODD.

THOUGHT (OR MUSCLE) READING.

[1301]—The peculiar power variously described as "thought reading," or "muscle reading" is much more prevalent than may by many be supposed. For some years past my family have occasionally amused themselves of an evening by what they call "willing" each other, with results which require more explanation than I can give. The process is this: One of our party, usually a lady, as they appear to be more susceptible to the influence, leaves the room, and during her absence something is arranged between those that remain for her to do, at present only such simple things as finding an article hidden in some part of the room, taking off some one's special ring, removing an article from one part of the room to another, sitting down upon a particular chair, selecting a photograph that has been fixed upon from a photograph-book and naming a number that has been written inside a closed envelope.

The lady to be "willed" is then brought into the room blindfolded; two other ladies, one on either side, each put their hands upon her shoulder, and, if a "willing" subject, she walks sometimes immediately, and sometimes after a few moments of apparent reflection, direct to the place appointed—as she declares afterwards—without knowing what part of the room she goes to, and proceeds to do what has been required of her. In the case of finding a photograph, some delay is occasioned while the leaves of the book are slowly turned over, accompanied with a rather distressed sighing until the right photograph is come to, and then the hand is put down decidedly upon the one chosen. In the case of a number inside an envelope, not more than two figures having been yet attempted, the envelope has been first found where it was hidden—say under the corner of the hearth-rug—and the lady being then asked to give the number inside, turns over the envelope in her hand with an anxious manner, and, after much distressed sighing, suddenly states it correctly.

If this process is tried by your readers many will be found, much to their surprise, to have the gift. We have tried it with visitors who have been utterly upon the subject, and, to their astonishment, have found themselves doing what was required of them without any power apparently of their own.

Some people, and I am one of them, seem quite incapable of this influence; but that it exists among many I have had too much occular proof to disbelieve, knowing, at the same time, as I do, that, as practised in my own family by my own daughter, it is perfectly free from any probability or possibility of collusion or deception. W. L. M.

P.S.—One lady of our acquaintance, who is very susceptible of this influence, has successfully gone through the performance blindfolded, without any actual contact with others, but she states that it is more difficult to accomplish under such conditions.

[This is the game spoken of on p. 444, in a reply to Mr. John Bell.—ED.]

THE TEACHING OF THE DIASCOPE.

[1302]—The prime fact to be noted in experimenting with the diascope is, that we imagine that the object seen by the right eye is seen by the left, and *vice versâ*. Now, one would have supposed that the object seen by the right eye would have appeared to be on the right side, and that by the left eye on the left, that the two objects, in fact, would have been apparently transposed; such, however, is not the case, and it has occurred to me, though I have not, at present, time to fully investigate the subject, that there may possibly be [nay, there must be.—R. P.] a *lateral*, as well as a vertical inversion, of the visible field on the retina; and that the left half of the field is seen by the right of the retina of the right eye, and the right half by the left of the right eye, and *vice versâ*, by the retina of the left eye—that is to say, the image of the visible field is laterally inverted in both eyes.

It is stated in works on physiology that single vision depends upon the image falling upon identical portions of the two retinæ. But have not the relative positions of the identical portions of the two retinæ hitherto been mistaken? The right side of one retina does not, as commonly taught, correspond with the right side of the other, but the right half of one with the left half of the other, just as in the disposition of the nerves of the right and left feet, those of the two outside toes and those of the two inside are the corresponding sets.

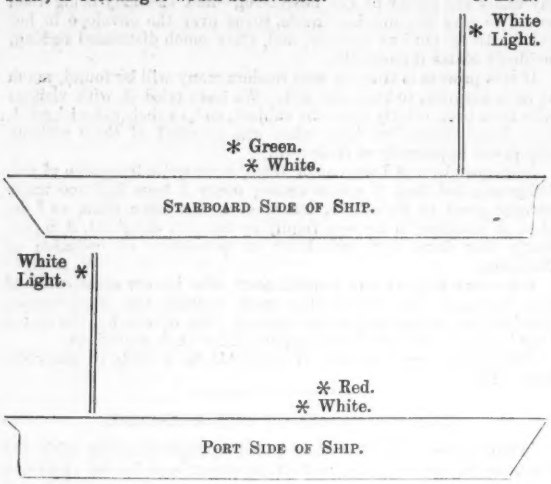
Not only, however, do the analogies of the positions of the corresponding, or *identical*, portions of the head, face, trunk, and limbs point to the two outer halves and the two inner halves of the retinæ as being respectively *identical*, but the probability of this being the case is considerably increased by reference to the evolution in the position of the two eyes in the mammaliæ; for from the very conditions of the lateral placement of the two eyes in quadrupeds, the two outer portions of the retinæ must be the corresponding or *identical* portions; and when an animal regards the visible field in front of it, the one half of the field must be seen by the outer portion of the retina of the left eye, and the left half of it by the corresponding outer portion of the retina of the right eye. In the progressive forward adjustment of the eyes to their position in man, it is very unlikely that the function of the two outer halves of the retinæ have been radically changed. From the very nature of this evolution, moreover, the two outer portions of the retinæ may be more sensitive than the two inner; and, therefore, it may be said that, virtually, the right half of the visible field is seen by the left eye, and the left half by the right. W. CAVE THOMAS.

"SENT TO THE BOTTOM."

[1303]—I have seen your articles on "Sent to the Bottom" in KNOWLEDGE, and I would suggest a simplification of it without impairing its efficiency. *Eight* lights seems a good many for every steamship or boat to carry. I fancy three might be dispensed with, and still every purpose answered. My plan would only be an addition of two more white lights to the existing system, and so far sailors would not have anything to unlearn in the rules and regulations of navigation.

Your triangle of three lights amidships to show at what angle a

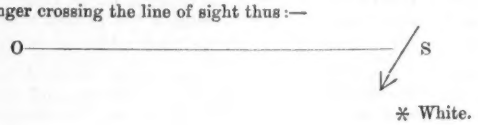
stranger is lying, I think, might be simplified to two, and still the angle at which the stranger is lying be equally ascertained. I send rough diagrams which will almost explain themselves. The white light at masthead might be made to show round half a circle, and this would clearly show whether the stranger was approaching or receding. If approaching, the white light on masthead would be seen; if receding it would be invisible. J. H. G.



— I. —

["O" the Observer; "S" the Strange Ship.]

Stranger crossing the line of sight thus:—



White.

Green.
White.

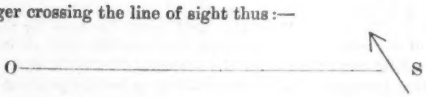
— II. —

Stranger crossing the line of sight thus:—

Green.
White.

— III. —

Stranger crossing the line of sight thus:—

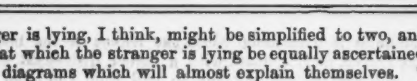


White

Red.
White.

— IV. —

Stranger crossing the line of sight thus:—



Red.
White.

FRONT-STEERING TRICYCLE.

[1304]—Your worthy correspondent and old subscriber, whose signature is, I regret, illegible, will find any good front-steering machine suit his purpose; but if he will kindly send me a private letter giving his height and weight, as well as his age, and stating whether he wishes to ride over hilly country or level roads, and whether the roads are bad or good, I will then recommend him a machine which, I believe, to be the best suited to his requirements.

Your correspondent is perfectly correct in supposing that there is as great a strain on the machine in mounting a hill with hill-climbing gear as without. In reality there is more. The strain is increased by the amount of extra friction caused by the more rapid revolutions of the hill gearing. The saving is only in the strain on the rider.

Every mechanic will know that what is gained in power is lost in speed. JOHN BROWNING.

63, Strand.

LOG OF THE DELUGE YEAR.

[1305]

Modern Hebrew dates.	Days from Flood.	
1 Tisri (658)	—	Noah enters his centurial year.
10 Chesvan	—	Finally ordered to be in the ark.
17 —	1	He is shut in; the world drowned; and all movables swept off to sea. (Glacial Drift.)
20 —	3	Probable completion of new sea-fall. Seeds begin germinating on all present uplands, except the tract round Ararat—depressed and submerged.
9 Kislen	22	Shortest day.
27 —	40	Promised clearing of weather about Noah. (Rainbow probably first seen.)
1 Tebet	43	Abulhassan Kushiar's New-moon era of the Deluge. (Herschel "Outlines," art. 926.)
17 Abib	150	Easter Day (3rd of Passover). The ark grounds.
28 Yiar	190	Ascension-day. Birds first released. The raven, not returning, must have found land near, though beyond the horizon.
5 Sivan	198	Dove sent second time; returns with leaf.
12 —	205	Third time, and never returns. (Longest day.)
1 Tamuz	222	Little Ararat emerges; the peak bearing the ark being now upheaved about a mile.
1 Tisri (659)	309	Noah's centurial birthday. He unroofs the ark, and sees all within his horizon dry.
27 Chesvan	365	Command given to disembark.

This may obviate some difficulties that might be raised about the rainbow letter. E. L. G.

THE PATENT ACT.

[1306]—In reply to the query on this subject, I beg to inform "Frank West" that the drawings filed with the provisional specification will *not* serve for the complete. Separate drawings are required for the latter in any case.

If two patents have been applied for, the specification for each must be complete and independent of the other.

I shall willingly answer further queries. POLYGLOT.

PERSPECTIVE.

[1307]—R. Jones (letter 1244) is, I think, perfectly right in his criticism of the usual method of showing the perspective of a cube.

The business of perspective is to delineate things *as they appear to the eye*, and therefore the relative distance of objects of equal size is indicated by differences of size corresponding to the differences of distance.

Applying this fundamental rule of perspective to the case in point, we see that when the cube is not directly in front of the spectator, one perpendicular edge of its face is slightly further away than the other. Now, of course, the further edge subtends a smaller angle with the eye, that is, it appears shorter than the other, and must be so represented.

"Ross Vansittart's" error (letter 1276), is in imagining the business of perspective to be the indicating of the distance-relationships between the object to be drawn and *a line drawn in front of the spectator*.

"An Old Draughtsman" (letter 1288), makes a similar mistake; he makes the fundamental rule to be that the relations between

the object and an imaginary perpendicular plane are to be indicated. If he will extend his imaginary plate of glass, say, 50 yards to the left, and place the cube behind it at that distance, he will at once see that, though the face "will equally be square," it will not by any means *appear* so. "An Old Draughtsman's" "unusual ways," are, of course, simply caricatures; he has immensely exaggerated the convergence of the face lines of the buildings. It hardly requires an artist's eye to see that there is something wrong also with his "usual way," especially in the first drawing. He adopts the *Chinese* method for the front-walls, while giving the side-walls in perspective correctly enough. CHAS. E. BELL.

AN ANIMAL ATTEMPTS SUICIDE?

[1308]—I quote the following passage from an account of the fire in the East London Aquarium: "Now and again the watchers without saw a black muzzle appear at the window, and soon the whole form of a huge black bear came into view. The spectators were then horrified by seeing the animal extend its paws and convey to its mouth the large jagged fragments of glass that were scattered before it. The effect of this dreadful repast was quickly shown by the rush of blood and foam which issued from the animal's mouth and nostrils, but an adventurous bystander left the excited crowd, clambered up the wall, and threw down the broken pieces of glass." In the result the bear was scorched and burned to death. I take this as a remarkable case of instinct shown in a bear, who, knowing it could not escape, tried to commit suicide in the best way it could, in order to put an end to its sufferings. The act of the bystander, although, no doubt, it was done with the best intentions, was really (so I think) an unkindness to the bear.

Surely, such a remarkable case should come before the readers of KNOWLEDGE. E. A. TINDALL.

LETTERS RECEIVED AND SHORT ANSWERS.

EDWARD A. MARTIN. The great length to which your communication extends forbids its insertion: an observation which other of our correspondents are respectfully requested to note.—K. Of course. You might safely offer a shilling to every reader of KNOWLEDGE unfamiliar with your cat experiment. You would find yourself very little poorer, indeed.—F. W. D. MITCHELL. I have, so far, seen nothing of your pamphlet.—JOHN J. KEEN. It would decidedly *not* be injurious to the lungs, but rather the reverse, to sleep in a room in which an open vessel of water was kept. Otherwise the unnumbered millions who have ewers of water in their bedrooms ought to have been dead of consumption long ago.—VERITAS. It is to be hoped that *you* are not Mr. Thompson. If so, you could hardly have selected a more inappropriate pseudonym. It is absolutely false that he has "put me down in argument." As for what I think of his nonsense, I think that shaving his head and the application of a blister to the nape of his neck might afford him relief. But what does it matter to any human being whether "he is very doubtful" that "the earth moves round the sun?" As a matter of fact, I *have* met "Parallax." Finally, as to my alias "and my being well-known as Barry Cornwall," I need only remark that Mr. Procter (the author, inter alia, of such well-known songs as "The Wild Cherry Tree," "The Sea," &c.), did write his poems under the *nom de plume* of Barry Cornwall, but it is a good many years now since he died. Mr. Thompson should be placed in confinement before he bites anybody.—F. GORE sends us a prospectus of Bain's Machine for Aërating Waters, and hopes that the attention of our contributor, Mr. J. S. Ady, may be directed to it.—T. B. finds fault with Mr. Ady's assertion that the diameter of the cells of Saccharomyces cerevisiæ is $\frac{1}{3000}$th of an inch. Carpenter, we note, in the last edition of his *Microscope*, gives their diameter as "averaging about $\frac{1}{3000}$th inch."—W. B. ROBINSON attacks Mr. Ady for hinting that a small quantity of alcohol is beneficial, and asserts that there can be no *moderation* in drinking a poison. There is such a thing as intemperance in argument as well as in the consumption of liquor.—ALFRED CHAPMAN. I am, I blush to say, so ignorant of the mysteries of the betting-ring that I do not even know how the Derby Stakes were divided. In the way in which you put the case it is obviously unfair.—JOHN HAMPDEN. Now just fancy! I never heard of the "Universal Knowledge and Information Office, 19 Southampton-street, Bloomsbury" before I received your letter. I do hope that you will win the hundred guineas.—GEORGE CHAPMAN. There is no such thing as centrifugal "force." What is so miscalled is the simple tendency of every body to persist in the motion it possesses in a straight line, unless deflected by some other force.—J. E. See article on p. 428. Thanks for your kindly-expressed personal interest.—F. BRABY vouches for the respectability of Mrs. Clow (p. 396), she being a person of Christian habits, having thirteen children, and her portrait in the Royal Academy.—W. H. HARLAND. Mr. McGough's knowledge of mathematics is greater than that of facts. The British Government never offered £30,000 (or thirty thousand farthings) for the trisection of an angle.—C. W. R. Your lengthy letter on "Coincidences" is not without interest, but they are of a nature very familiar to all who have to consult books.—WILLIAM BROWN. The publishers are the people who would have sent you the Index to Vol. I., not the Editor, who has nothing to do with the paper in its business capacity. As a matter of fact, that Index has long been out of print, and a copy of it would be cheap at a shilling.—W. GRIMSHAW and W. W. point out that the penultimate chess problem on p. 426 is taken from Anderssen.—H. A. NESBITT. One of the very numerous answers we have received to letter 1295. — A. BROOK. I regret the delay in noticing your communication. The subject of the demonetisation of half-sovereigns is scarcely of sufficient *popular* interest to justify me in occupying space with it just now.—Will "W." and others, who write on Chess, please address *Chess Editor?*—E. L. G. Your hypothesis of the physical constitution of the æther is quite as valuable as any of the rest. Your "Log of the Deluge Year" will appear to supplement your rainbow letter; but you must not suppose that I endorse either your history or your chronology.—J. W. ROBERTSON. The blunder in "The Face of the Sky," on p. 421, to which you refer, is wholly and solely the compositor's. "F.R.A.S." wrote 5·8 in. in his MS. as plainly as possible. All celestial phenomena are described by our contributor as seen from Greenwich. You might with advantage impart your experience as to ship's lights not being kept burning, to the President of the Board of Trade.—H. W. FEY. Science can say nothing as to the primal origin of matter. For aught she can tell it may be eternal. I cannot follow your sphere argument, because you start with a lot of ready-made suns (your pin-heads). Besides every sun of your hundred would attract, and be attracted by every other sun, directly as their masses and inversely as the squares of their respective distances.—A. H. B. May I repeat to you Scrooge's address to the ghost of his quondam partner Marley, "Don't be flowery, Jacob." Seriously, you have told in what would fill a page of KNOWLEDGE, that which might well have been compressed into a quarter of a column.—MONGE. I don't know.—W. E. M. If we admit that surnames have had their origin in personal peculiarities, it is easy to imagine how a Black man, a White man, a Brown man, or a Grey man should have been each called after his leading characteristics. You and I both know some particularly "Green" men; while there is, or was, a shopkeeper at Shanklin, in the Isle of Wight, named "Blue;" and every one has heard a school-boy who has made a false quantity in a Latin verse Yell oh! in a subsequent interview with his master.—EDWARD A. MARTIN. Thanks; but your explanation extends to an inordinate length. If I printed a third of the letters I receive in the condition in which they reach me, I should have to issue perpetual supplements.—MRS. E. M. KING. The article which meets with your approval was the direct result of personal experience. I am anxious, as far as possible, to adopt a judicial attitude with regard to the matter of dress reform, and admitted it for the value it possessed as actual personal testimony. Your record of the manner in which the rude inhabitants of a country village have become used and reconciled to your own even more pronounced costume, doubtless is typical of the popular attitude in all such cases. I quite agree with both my fair contributor and yourself that the Turkish trouser is "simply *impossible*."—A READER FROM THE COMMENCEMENT is anxious to elicit the opinion of Mr. Clodd as to the best means of developing the intelligence of the average type of rustic child, which he appears to consider to differ very considerably in degree from that of the offspring of parents of higher social rank. He expresses a doubt that the issue of very stupid parents could be developed into a very intelligent person in a single generation.—W. BASEVI SAUNDERS. The account of the glorious New Zealand sunsets sent home by your lady friend scarcely offer a sufficient amount of novelty or difference from those received from other parts of the world to justify me in reprinting it. The rainbow she saw against the clear blue sky was certainly a remarkable and altogether unusual phenomenon.—E. BRADSHAW. Truly the act you describe was one of "ignorance and blindness," and deserves your deunciation.—B. JONES. Are you not just a shade hypercritical?—S. L. B. corroborates (at too great length) Mr. Beveridge's assertion that stereoscopic pictures may be combined by the eye outwardly; and regards his experience as utterly destructive of the Berkeleyan theory of vision, believing that if the Bishop of Cloyne had ever seen a stereoscope, his "Theory" would not have been written.—J. H. M. Think again. Squeeze a piece of deal—or a piece of lead; heat is developed in both cases by compression. See Tyndall's "Heat Considered as a Mode of Motion."—J. L. H. The fault is apparently in your prime conductor, the comb being either too close to the rubber or too far from the glass. A fault not

unfrequently met with is that the points forming the comb are disconnected.

ERRATUM.—The signature to letter 1284 (p. 421) should have been "G. L. Brown," and not "*E.* L. Brown."

Our Mathematical Column.

EASY LESSONS IN CO-ORDINATE GEOMETRY.

BY RICHARD A. PROCTOR.

(*Continued from p.* 425.)

40. It is of great importance that the reader should remember the interpretations of the constants which appear in the general equation to the straight line. For this reason we give another discussion of the form

$$Ax + By + C = 0 \quad \text{(i.)}$$

Suppose, first, that none of the constants vanish.

Put $x = 0$, then (i.) becomes

$$By + C = 0,$$

that is,

$$y = -\frac{C}{B}.$$

Hence $\left(0, -\frac{C}{B}\right)$ is a point on the locus of (i.)

Similarly, by putting $y = 0$, we can show that $\left(-\frac{C}{A}, 0\right)$ is a point on the locus of (i.)

Lastly, let x_1, y_1, be the co-ordinates of a point on the locus of (i.), so that

$$Ax_1 + By_1 + C = 0 \quad \text{(ii)}$$

Then from 16 it follows that the area of the triangle formed by joining the points x_1, y_1; $0, -\frac{C}{B}$; and $-\frac{C}{A}, 0$,

$$= \pm \left\{ \frac{C}{A} y_1 + x_1 \frac{C}{B} + \frac{C}{B} \cdot \frac{B}{A} \right\}$$

$$= \pm \frac{C}{AB} \left\{ Ax_1 + B y_1 + C \right\}$$

$$= 0, \text{ from (ii)}$$

That is, the area of the triangle formed by joining any point whatever on the locus of (i) with the two fixed points $\left(0, -\frac{C}{B}\right)$ and $\left(-\frac{C}{A}, 0\right)$ is 0; a relation which shows that the locus of (1) must be a straight line passing through these two fixed points,—that is, a straight line whose intercepts on the axes of x and y are $-\frac{C}{A}$, and $-\frac{C}{B}$, respectively. Thus the trigonometrical tangent of the angle at which the line is inclined to the axis of x

$$= -\frac{-\frac{C}{B}}{-\frac{C}{A}} = -\frac{A}{B}$$

If A = 0, or B = 0 the equation assumes the forms already discussed in 27.

If C = 0, the equation assumes the form discussed in No. 30. It may be useful, however, to show how this case can be treated by the method of the present article. The origin is obviously a point on the curve since (1) is satisfied when $x = 0$, $y = 0$. Now let x_1 y_1, and x_2 y_2 be the co-ordinates of two other points on (I), then by 16, the area of the triangle formed by joining these two points and the origin

$$= \tfrac{1}{2} (x_2 y_1 - x_1 y_2) \quad \text{(iii)}$$

But since the points x_1 y_1, x_2 y_2 are on the locus of (1)

$$Ax_1 + By_1 = 0$$
$$Ax_2 + By_2 = 0$$

so that

$$\frac{x_1}{y_1} = \frac{x_2}{y_2} \text{ or } x_2 y_1 - x_1 y_2 = 0$$

and the expression for the area vanishes as in the first case, showing that the locus of the equation is a straight line through the origin.

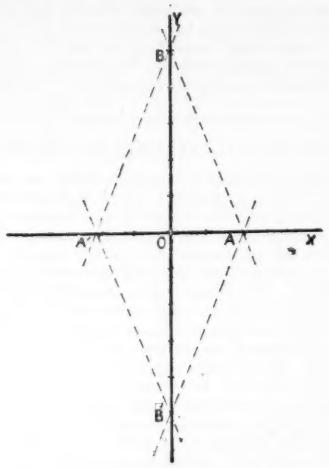
41. The results of the preceding article enable us to construct the line corresponding to any given equation of the first degree. Thus suppose we wish to draw the line whose equation is

$$5x + 2y - 10 = 0 \quad \text{(i)}$$

putting successively $x = 0$ and $y = 0$ we obtain, as in Art. 40 the intercepts on the axes of y and x from the equations

$$2y - 10 = 0, \text{ and } 5x - 10 = 0$$

respectively. That is, these intercepts are 5 and 2 respectively. Hence, if we take OA = 2 and OB = 5, the straight line through the points A and B is the required locus.



The reader will readily see that the equations

$$5x - 2y + 10 = 0 \quad \text{(ii)}$$
$$5x + 2y + 10 = 0 \quad \text{(iii)}$$

and

$$5x - 2y - 10 = 0 \quad \text{(iv)}$$

represent respectively the lines BA′, A′B′, and B′A, OA′ being taken = 2 and OB′ = 5.

42. *Note.*—It may be remarked also generally that if (using the same figure) O A = O A′ = a, and O B = O B′ = b, the equations to the four straight lines A B, B A′, A′ B′, and B′ A are respectively

$$\frac{x}{a} + \frac{y}{b} = 1$$

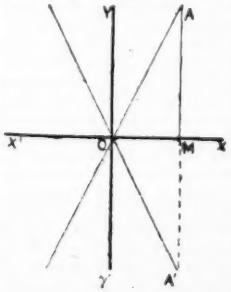
$$-\frac{x}{a} + \frac{y}{b} = 1$$

$$-\frac{x}{a} - \frac{y}{b} = 1$$

$$\frac{x}{a} - \frac{y}{b} = 1$$

43. If the equation of the first degree whose locus we require contains no constant term we know that it represents a straight line passing through the origin. Hence we need only determine one other point of the line. Thus take the equation

$$5x - 2y = 0 \quad \text{(i)}$$



Putting $x = 2$ we get $y = 5$. Thus if we take O M = 2 and from M draw M A = 5 parallel to O Y, then the straight line through the points O and A is the locus of (1).

And similarly it may be shown that the equation

$$5x + 2y = 0 \quad \text{(2)}$$

represents the straight line through the points O and A′; the point A′ being obtained by taking O M = 2, and drawing from M, M A′ = −5 (and therefore below O X) parallel to O Y′.

44. The reasoning in 29 requires modifying if the axes are oblique. We attain as in that article,

$$y = \text{M N} + \text{O C}$$

hence, putting ∠ C A O = α, and remembering that ∠ X O Y = ω, we get

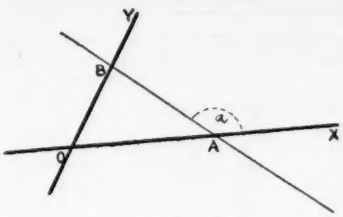
$$y = \frac{\sin \alpha}{\sin (\omega - \alpha)} x + c$$

which we may write as in Art

$$y = mx + c$$

if we remember that m is no longer equal to tan C A O, that is to tan α, but to $\frac{\sin \alpha}{\sin (\omega - \alpha)}$

The results of 33–41 require no change for oblique axes, except that it is to be noted that the value of $-\frac{A}{B}$ is now $\frac{\sin a}{\sin(\omega - a)}$ where a is the angle which the line makes with OX. That $-\frac{A}{B} = \frac{\sin a}{\sin(\omega - a)}$ obviously follows from 38 modified as above when C = O, and when C is not = O, it follows from the values of the intercepts. For evidently



$$\frac{OB}{OA} = \frac{\sin BAO}{\sin OBA} = \frac{\sin a}{\sin(\omega - a)}$$

$$i.e.\ \frac{\sin a}{\sin(\omega - a)} = -\frac{-\frac{C}{B}}{-\frac{C}{A}} = -\frac{A}{B}$$

See note on 39.

We shall not make much of the equations to a straight line with oblique co-ordinates. They are very useful occasionally, however, for particular purposes.

(To be continued.)

Our Whist Column.

BY FIVE OF CLUBS.

HOME WHIST.

I AM often asked whether Whist is really worth the trouble which, as it seems, must be given to it to make the game really enjoyable. Others ask whether there is no short cut to Whist enjoyment.

It may be assumed that most of those who sit down to the game find some sort of pleasure in it, despite the gloomy and ferocious aspect which some few exhibit at the Whist-table. Yet undoubtedly not one person out of twenty plays the sort of game which a true Whist-player can even begin to enjoy. There is no system whatever in their play, except apparently to take every trick they see their way to, at the earliest possible opportunity. They give up the command of their own suits and their partner's, and the power of checking their opponents in *their* suits, without any idea of what they are doing. If an opponent brings in a long suit, even though he had never a chance of doing so till they threw the power into his hands, they say only, How very unfortunate we were. If their partner, however mildly, points out that it is unsafe to give up the command of *every* suit, they answer at random, not knowing, in truth, what on earth their partner is driving at. You will see one of these players, having a good suit practically established (one round only being required to draw the enemies' King card in the suit) and a re-entering card in each of the opponents' suits—trumps being out—quietly gather in the two tricks he has safe in these suits, lead his own suit, and when the enemy proceed to work out their suits, discard from his established but now useless suit, perfectly unconscious of the fact that every card thus played would have been as good as a trump if he had only kept his re-entering cards. But if, chancing to be his partner, you should call his attention to this fact, or rather try uselessly to do so, he will probably say that all these little niceties and technicalities (what *are* re-entering cards?) are beyond him. He plays Whist for the game, not to win; and besides he could not *know* that the cards lay so that he could have made those tricks,—to which, if you are wise, you will reply with the soft answer which turneth away wrath, saying, "Pardon me, you are right; you could not know," only letting the least *soupçon* of an emphasis on the second "you" give a slightly altered meaning to the words.

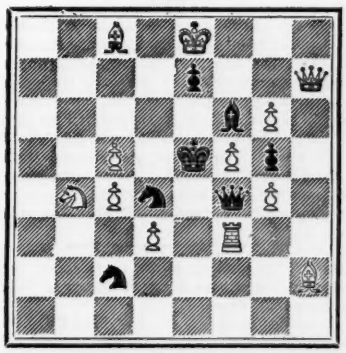
But in truth Whist is a splendid home game; and though not every one can be a great Whist player, or would at all care to be one, any one can in a few evenings' watchful play, learn enough of the principles of the game to make every hour of practice tell, and to enjoy the game thoroughly and intelligently. After learning the leads, which I gave fully a few weeks ago in a column of matter, he should note as the A, B, C of the game these genera principles. (1) Return the highest of two left after first round of a suit, the lowest of three or more. (2) In playing to a trick the owest of a sequence should be played (if either); but in leading, the highest—save only King from Ace King. (3) Second hand play lowest of a head sequence of two if you hold but one other, highest if you hold two others or more, excepting from Ace King or King Queen, when you should play from the sequence (lowest of course). (4) Third in hand, play Queen from Ace Queen; but in other cases do not *finesse* in your partner's suit. (5) Lead trumps if you hold five or more, unless playing for the odd trick, when it is rarely well to lead trumps except defensively (for notice that if there is often a risk of losing the odd trick through leading trumps, it may often also happen that you destroy the enemy's chance of making the odd trick by drawing trumps). (6) When strong play as open a game as possible, when weak be more reserved; in the former case you do more good by informing your partner than harm by informing the enemies; in the latter the reverse holds. (7) Discard from your weakest suit, unless the trumps are *decidedly* against you. (8) Notice your partner's discard, and if trumps are not against you, regard the suit he discards from as the enemy's. (9) Signal only when *very* strong. (10) Notice the signal, but observe that the whole duty of the Whist-player is not fulfilled when he has observed his partner's signal (or that his partner is not signalling). (11) Observe that the play of a lowest card does not prove that your partner is not anxious to signal. (12) Notice, further, that it is about twice as important in the long run to observe the enemy's signals as your partner's. Avoid every possible action by which the state of your hand may be indicated, such as (i) signs of pleasure or the reverse; (ii) extending your hand to take a trick which you know from your own hand to be won by your partner's card; (iii) asking your partner unnecessarily to draw his card; (iv) hesitating obviously as to signalling and *then* playing lowest card; and so forth. Lastly, KEEP YOUR EYES ON THE TABLE,—half the faults of play arise from the bad habit of looking always at your hand.

Our Chess Column.

BY MEPHISTO.

SELECTED PROBLEM.

BLACK.



WHITE.

White to play and mate in two moves.

SOLUTION OF PROBLEM, p. 426.

1. R to R2	1. B takes Kt
2. Q to R sq	2. Anything
3. Q mates accordingly.	

If 1. B to B2, then 2. Kt to B6; or if 1. B to Q sq, 2. Kt to B8, and mate next move.

Most first-class players at Chess were possessed of a brilliant style in the earlier stages of their career. Steinitz, in his younger days, played games which, in point of brilliancy, were only second to Morphy's phenomenal productions. Mason, formerly a rapid and brilliant player, is now slow and deliberate, and plays that kind of game which gives the opponent an idea of being slowly but surely squeezed by a hydraulic press. Blackburne, whose play was always delightfully original, now mostly adopts the quieter style in match play. This change of style, observable in individual players, may also be traced in the general progress of Chess. With the advance of the science of Chess play, the brilliant old Italian school was

gradually replaced by more modern analysts, and these in their turn had to yield to the present school of players represented by Steinitz and Zukertort.

Chess is in this respect only taking the same course which all other branches of human research and human skill have taken ever since Newton discovered the law of gravity. It is the "positive" substance of a thing physical or moral which determines its relative position in the order of things. No amount of imagination can for a length of time sustain a fictitious value given to a body in nature or to a variation at Chess. In the scales of reason a deficiency of weight below the estimate will sooner or later be discovered. Inexorable mathematical truths govern everything, and the tendency of the day is an advance towards positive results.

It is, therefore, natural that those players aiming at a high standard of efficiency should cultivate a *true*, in preference to an *imaginative*, style of play. Moreover, in their capacity as leading players or Chess analysts, they really do the most good to the cause of Chess by teaching soundness. They infuse strength into the combination of weaker players, and render the imaginative player more ingenious by cultivating his judgment.

Bringing these theories to bear on the conduct of openings, we are bound to come to the conclusion that there is only one really reliable opening known. It would therefore save a great deal of trouble if we should advise our readers for safety's sake always to play 1. Kt to KB3. as their first move. But then this would lead to a dull kind of game, which we should not like to see cultivated by ordinary amateurs, although justifiable in first-class players. We should also fall foul of Mr. Ruskin. On the other hand, if we should recommend many of the attacking lines of play, we should have to go into lengthy analyses of each opening, in order to place our readers on a safe footing in each *début*, whereby again we should displease Mr. Proctor, who requires short dissertations of the leading lines of play. Besides the difficulty we have to contend with, whether to recommend only a safe course of play, which is the only thing that can be done in a few chapters, or to advise the practice of various attacking openings, which would require a long series of analytical articles, there is yet another matter requiring consideration: we have to advise players both in the conduct of attack and defence. Bearing all these points in mind, we have come to the conclusion not to advise our readers at all to any particular course, but give such general instructions in the openings so as to enable them to chose any line they please, without, however, touching upon those lines of play which, as Mr. Proctor put it, may be avoided by both players.

A player may get through an immense amount of play if, as first player, he plays the Ruy Lopez, and, as second player, the French Defence. The late De Vere very seldom played anything else. We shall, therefore, first proceed to make our readers acquainted with the principal lines of these openings both for attack and defence. We shall next proceed to give the leading variations of the Evans, Scotch, and Algaier gambit. For the benefit of those who do not wish to accept gambits we shall give a good specimen of the Gambit Declined. These openings suffice for ordinary purposes, and we shall leave it entirely to our readers whether they wish to adopt any one, two, or all of these openings in their ordinary play.

In reference to the ending given in our last week's number, p. 446, we have to state that we were incorrect in assuming that White could not win. After—

P to Kt5	R to R2
P to R4	R takes P
P to K7 and wins.	

Rome, June 8, 1884.

I beg to inform you that the beautiful "ending" sent to you "by a correspondent," and published in the last No. of KNOWLEDGE, is, in fact, as you rightly conjecture, a "problem," and composed by Anderssen. It was, as far as I can discover, *first* published as Problem XXXI. of "Aufgaben für Schachspieler, von A. Anderssen (Breslau, 1842)," and has been reproduced in Miles' "Chess Gems" and elsewhere. C. B. VANSITTART.

PROBLEM 118, P. 319, BY F. J. LEE.—Our correspondent, W. Hannahan, of Dublin, has kindly sent us a copy of the *Irish Fireside* of April 7th. This paper contains a problem exactly similar in position to the above problem, and composed by F. Healey. Although the source from which the latter problem is taken is not quoted, we conclude that it has been taken from his published collection of problems. It is clear to our mind that Mr. Lee's problem is a plagiarism of Mr. Healey's production.

W. H. S. M.—You are quite right in what you state; we missed the point in this ending.

Correct solutions received from Gainsborough, Caissa, Edw. Stevens, Alfred C. Huxley, Uncle John, H. A. N., George George, John Watson.

Another, and, perhaps, the best specimen of the various games contested between Mr. McConnell and Dr. Zukertort at the New Orleans Chess, Checkers, and Whist Club, May 7, 1884:—

TWO KNIGHTS' DEFENCE.

White. Mr. Jas. M'Connell.	Black. Dr. Zukertort.	White. Mr. Jas. M'Connell.	Black. Dr. Zukertort.
1. P to K4	P to K4	16. B to Kt5	Q to Kt3 (*d*)
2. K Kt to B 2	QKt to B3	17. QR to Q sq	Q to B2
3. B to B4	Kt to B3	18. R to Q2	P to KR3
4. Kt to B3	B to Kt5	19. B to K3	R to Qsq
5. P to QR3	B × Kt	20. P to QKt4	K to Bsq
6. QP × B	Kt × P	21. B to B5 (*e*)	P to QKt3
7. B × P (ch)	K × B	22. P to Kt5	Kt to R4
8. Q to Q5 (ch)	K to Ksq	23. B to Kt4	Kt to B5
9. Q × KKt	P to Q4	24. QR to K2	P to QR4
10. Q to QR4	R to Bsq (*a*)	25. P × P *en passe*	P to B4
11. Castles (*b*)	R × Kt (*c*)	26. B × P	P × B
12. P × R	B to R6	27. R to Ktsq! (*f*)	R to Q2 (*g*)
13. R to K sq	Q to B3	28. R × P! (*h*)	R to Q3
14. Q to KB4!	K to Q2	29. P to R7	Q × P
15. Q to Kt3	B to B4	30. R × B	

And Black resigned.

(*a*) Up to this point the moves are identical with those of a *partie* between the same players given in our column.

(*b*) In the game mentioned, it will be observed that White here played 11. Kt takes P. We much prefer the text play.

(*c*) Over-bold, perhaps, and doubtless not taking into consideration the effective replies at White's command, as shown in his 13th and 14th moves following.

(*d*) 16. * * Q to B2, at once, appears much better.

(*e*) Necessary to prevent the advance of the adverse Rook to Q3 and thence to Kt3, which would threaten the Queen and give Black a strong attack. Although the text move involves the sacrifice of the Bishop, the sequel shows it to have been judiciously planned and made, as White thus gains what proves to be an irresistible attack on the Queen's side.

(*f*) Promptly taking control of the commanding file opened by the sacrifice of the Bishop.

(*g*) 27. * * R to Q3 would have been somewhat better, as Dr. Zukertort subsequently observed, but it would seem that Black's game is now indefensible in any event.

(*h*) The finishing blow! Clearly Black dare not capture the Rook with the Knight.—*Times Democrat.*

CLAIM has recently been made for having produced platinum wire of extreme thinness; but that this is no new thing is demonstrated by the following contribution to the *Scientific American*:—"Dr. Wollaston published in 1813—Philos. Trans.—an account of his making the wire $\frac{1}{1800}$ in. diameter. Mr. E. W. Arms has, since the fall of 1876, handled large quantities of it, as shown in hundreds of transits and levels now in use. The size ordinarily used for field transits is platinum wire of 0·003 in., covered with silver to 0·1 in.; this drawn to 0·003 in. will leave the platinum when the silver is dissolved off to be 0·00009. This wire will sustain a weight of four grains, or a ball of wax the size of a pea."

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